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# COORDINATION OF OUTER SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM: PROGRAMMES OF WORK FOR 1994 AND 1995 AND FUTURE YEARS

## Report of the Secretary-General

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# ACRONYMS

## United Nations Secretariat units, bodies, research institutes and specialized agencies

| | |
|---|---|
| DESD | Department of Economic and Social Development |
| DHA | Department of Humanitarian Affairs |
| ECA | Economic Commission for Africa |
| ECLAC | Economic Commission for Latin America and the Caribbean |
| ESCAP | Economic and Social Commission for Asia and the Pacific |
| ESCWA | Economic and Social Commission for Western Asia |
| FAO | Food and Agriculture Organization of the United Nations |
| ICAO | International Civil Aviation Organization |
| ILO | International Labour Organisation |
| IMO | International Maritime Organization |
| ITU | International Telecommunication Union |
| UNDP | United Nations Development Programme |
| UNDRO | Office of the United Nations Disaster Relief Coordinator |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNIDO | United Nations Industrial Development Organization |
| UNITAR | United Nations Institute for Training and Research |
| WHO | World Health Organization |
| WIPO | World Intellectual Property Organization |
| WMO | World Meteorological Organization |

## Other

| | |
|---|---|
| AARS | Asian Association for Remote Sensing |
| ACMAD | African Centre of Meteorological Applications for Development |
| AIFM | Asian Institute of Forest Management |
| ARTEMIS | Africa Real Time Environmental Monitoring Information System (FAO) |
| AVHRR | advanced very high resolution radiometer |
| BDT | Telecommunications Development Bureau (ITU) |
| BR | Radiocommunications Bureau (ITU) |
| CAS | Commission for Atmospheric Sciences (WMO) |
| CCRS | Canada Centre for Remote Sensing |
| CEOS | Committee on Earth Observation Satellites |
| CERA | Centre for Earth Resource Assessment |
| CILSS | Permanent Interstate Committee for Drought Control in the Sahel |
| CNS/ATM | Communications, navigation, and surveillance and air traffic management |
| CNT | Centre national de télédétection |
| COSPAR | Committee on Space Research (ICSU) |
| CRTO | Ouagadougou Regional Remote Sensing Centre (ECA) |
| DCP | Data collection platform |
| DIANA | Data and Information Available Now in Africa (FAO) |
| DSE | FAO/German Foundation for International Development |
| EC | European Community |
| EIS | Environment Information System |
| EROS | Earth Resources Observation Systems |
| ESA | European Space Agency |
| ESRIN | European Space Research Institute |

| | |
|---|---|
| FANS | Future Air Navigation System |
| FAORSC | FAO Remote Sensing Centre |
| FINNIDA | Finnish International Development Agency |
| FRA90 | Forest Resources Assessment 1990 project (FAO) |
| GARS | Geological Applications of Remote Sensing (UNESCO) |
| GAW | Global Atmosphere Watch (WMO) |
| GCOS | Global Climate Observing System (WMO/IOC/UNEP) |
| GDTA | Group for the Development of Aerospace Remote Sensing |
| GEF | Global Environment Facility |
| GEMS | Global Environmental Monitoring System |
| GEWEX | Global Energy and Water Cycle Experiment |
| GIEWS | FAO Global Information and Early Warning System on Food Security |
| GIS | Geographic Information System |
| GMDSS | Global Maritime Distress and Safety System (IMO) |
| GOES | geostationary environmental satellites |
| GOOS | Global Ocean Observing System (IOC) |
| GO$_3$OS | Global Ozone Observing System |
| GORS | General Organization of Remote Sensing of Syrian Arab Republic |
| GPS | Global Positioning System (United States of America) |
| GRID | Global Resource Information Database |
| GRIP | GEWEX Continental-scale International Project |
| GTOS | Global Terrestrial Observing System |
| HDTV | high-definition television |
| IACC | Inter-Agency Consultative Committee |
| IAF | International Astronautical Federation |
| IBPGR | International Board for Plant Genetic Resources |
| ICC | Intergovernmental Consultative Committee |
| ICPIC | International Cleaner Production Information Clearinghouse (UNEP) |
| ICSU | International Council of Scientific Unions |
| IDNDR | International Decade for Natural Disaster Reduction |
| IGADD | Intergovernmental Authority on Drought and Development |
| IGN | Institut géographique national |
| IGOSS | Integrated Global Ocean Service System (IOC/UNESCO/WMO) |
| IHO | International Hydrographic Organization |
| IHP | International Hydrological Programme |
| ILEC | International Lake Environment Committee |
| INFOTERRA | International Referral System for Courses of Environmental Information (UNEP) |
| INMARSAT | International Maritime Satellite Organization |
| IOC | Intergovernmental Oceanographic Commission (UNESCO) |
| IOMAC | Indian Ocean Marine Affairs Cooperation |
| IP | image processing |
| IPDC | International Programme for the Development of Communication |
| ISCCP | International Satellite Cloud Climatology Project |
| ISDN | Integrated Service Digital Network |
| ISLSCP | International Satellite Land-Surface Climatology Project |
| ISY | International Space Year |
| ITC | International Institute for Aerospace Survey and Earth Sciences (Netherlands) |
| IUGS | International Union of Geological Sciences |
| JEFAD | Joint ECA/FAO Agriculture Division |
| LAC | local area coverage |
| LIS | LANDSAT Information System |

| | |
|---|---|
| MAB | Man and the Biosphere |
| MARC | Monitoring and Assessment Research Centre (UNEP) |
| MDD | Meteosat Data Dissemination |
| MSS | multispectral scanner |
| NASA | National Aeronautics and Space Administration (United States) |
| NDVI | Normalized Difference Vegetation Index |
| NLR | Dutch National Aerospace Laboratory |
| NOAA | National Oceanic and Atmospheric Administration (United States) |
| PDUS | Primary Data Users Station |
| PSS | packet switching system |
| RASCOM | Regional African Satellite Communications System |
| RCSSMRS | Regional Centre for Services in Surveying, Mapping and Remote Sensing (ECA) |
| RECTAS | Regional Centre for Training in Aerospace and Surveys (ECA) |
| RESPAS | Remote Sensing Processing and Archiving System (FAO) |
| RIS | Regional Information Service (ESCAP/UNDP/RRSP) |
| RMTN | Regional Meteorological Telecommunication Network |
| RRSP | Regional Remote Sensing Programme (ESCAP) |
| SADCC | Southern African Development Coordination Conference |
| SAFISY | Space Agencies Forum for International Space Year |
| SAR | synthetic aperture radar |
| SCOPE | Scientific Committee on Problems of the Environment |
| SOTER | Soils and Terrain database |
| SPOT | Experimental Earth Observation Satellite (France) |
| TM | Thematic Mapper (LANDSAT satellite) |
| TREDMAR | Training and Education in Marine Science (UNESCO) |
| TREES | Tropical Ecosystem Environment Observations by Satellite |
| TSB | Telecommunications Standardization Bureau (ITU) |
| UNCED | United Nations Conference on Environment and Development |
| UNISPACE 82 | Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space |
| USAID | United States Agency for International Development |
| WARC-92 | World Administrative Radio Conference |
| WCRP | World Climate Research Programme |
| WOCE | World Ocean Circulation Experiment |
| WWW | World Weather Watch (WMO) |

## INTRODUCTION

1. The present report has been prepared by the Secretary-General at the request of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space and concerns efforts at coordinating the activities of organizations within the United Nations system that relate to assistance to developing countries in the practical application of space technology.*

2. The report is based on the contributions submitted by the organizations concerned in response to the United Nations request for information on concrete programmes of work envisaged primarily for 1994 and 1995, and was reviewed in its draft form at the Inter-Agency Meeting on Outer Space Activities, held at the headquarters of the International Telecommunication Union (ITU) at Geneva, from 11 to 13 October 1993.

3. The report consists of three sections: Section I contains a list of the participants in outer space activities within the United Nations system. A matrix of outer space programmes is also provided to identify the activities of each participant in specific fields. Section II presents a summary of major activities and programmes planned for 1994 and 1995 and future years by the organizations within the United Nations system as a whole. Section III presents concrete activities or programmes planned by individual organizations in an integrated form under substantive headings - remote sensing, communications, meteorology, hydrology, space science, use of space technology for maritime communications and for air navigation and other activities in the field of space science and technology and its applications - rather than under organizations by which they are conducted.

## I. PARTICIPANTS IN OUTER SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM AND MATRIX OF OUTER SPACE ACTIVITIES

4. The participants in outer space activities within the United Nations system included the following Secretariat units, bodies, research institutes, specialized agencies and other organizations: Office for Outer Space Affairs, Office of Legal Affairs, Department of Economic and Social Development (DESD), Department of Humanitarian Affairs (DHA), United Nations Environment Programme (UNEP), Economic Commission for Africa (ECA), Economic and Social Commission for Asia and the Pacific (ESCAP), United Nations Development Programme (UNDP); United Nations Institute for Training and Research (UNITAR); Food and Agriculture Organization of the United Nations (FAO); United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Industrial Development Organization (UNIDO), International Civil Aviation Organization (ICAO), World Health Organization (WHO), International Telecommunication Union (ITU), World Meteorological Organization (WMO), International Maritime Organization (IMO), World Intellectual Property Organization (WIPO); and World Bank.

5. A matrix of outer space programmes within the United Nations system is presented below.

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*This is the nineteenth such annual report. The first 18 reports were contained in documents A/AC.105/166, 183, 201, 223, 242 and 278, A/CONF.101/BP.11/Add.1, A/AC.105/309 and Corr.1, A/AC.105/325, 342, 359, 373, 389, 415, 444 and Corr.1, 465 and Corr.1, 491 and Corr.1 and A/AC.105/524.

## PARTICIPANTS IN OUTER SPACE ACTIVITIES AND MATRIX OF OUTER SPACE PROGRAMMES a/

| Participants | Remote Sensing | Communications | Meteorology and hydrology | Basic space science | Mobile services | Other applications | ISY |
|---|---|---|---|---|---|---|---|
| OOSA b/ | 17(a-k),21(b-c),37, 43-45,116,139-141 | 145,149,160 | 176-177 | 211-212 | | 220-221 | 224 |
| OLA c/ | | 166 | | | | 223 | |
| DESD | 69 | | | | | | |
| DHA | 114 | 147-148, 159 | | | | | |
| UNEP | 29-31,52-55,72-84, 90, 100-104,123-128 | 156,163-164 | 174,187-190,197-199, 200(a-c),201(a-c), 202-203 | | | | |
| ECA | 17(l-m),21(g),22-27, 38-39,46-48,50-51, 105-112,120-122, 137-138,143 | | | | | | |
| ESCAP | 18(a-e),19(a-h), 20(a-c),40, 49(a-b),70-71, 117-119 | | | | | | |
| UNDP | 18(a-e),20(a-c) | | 178(b) | | | | |
| UNITAR | 27(b),28(a-c) | | | | | | |
| FAO | 17(l),21(a-n),42, 56-66,86,90,93-99, 113,129-130, 133-137,143(a) | 155 | 179 | | | | 224,226 |
| UNESCO | 17(l),32-35,41(a-f), 85-90 | 153-154 | 182,195,197-199, 200(a-c), 201(a-c), 202-209 | | | | 224 |
| UNIDO | 36 | | | | | 222 | |
| ICAO | | 170-171 | | | | | |
| WHO | 91-92,132 | 146,157-158,165 | | | 215 | | 224-225 |
| ITU | 85 | 150(a-c),151-152, 161(a-h),162,167-168 | 173,210 | | 218-219 | | |
| WMO | 57 | | 172,175,178(a-c), 181-183,184(a-d), 185-186,191-199, 200(a-c),201(a-c), 202-203 | | | | 224,227 |
| IMO | | | | | 213-214 216-217 | | |
| WIPO | | 153(c),169 | | | | | |
| World Bank | 55-57,67,68,131 | | | | | | |

a/ The numbers in each column indicate the relevant paragraphs in the present report.
b/ Office for Outer Space Affairs.
c/ Office of Legal Affairs.

## II. SUMMARY OF MAJOR ACTIVITIES AND PROGRAMMES PLANNED FOR 1994 AND 1995 AND FUTURE YEARS

6. The organizations within the United Nations system have planned activities for 1994 and 1995 and future years within the categories of remote sensing, communications, meteorology, oceanography and hydrology. Organizations within the United Nations system will also conduct valuable outer-space-related or -aided activities in basic space sciences and in land, maritime and aeronautical communications and other activities related to space science and technology and its applications. The planned activities generally range from education and training programmes, through fellowships, training workshops and summer schools, to expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out relevant studies or pilot projects as well as to disseminate information on the status of technology. Also, organizations within the United Nations system are preparing regional feasibility studies and designing education training programmes in remote sensing and satellite communications to establish indigenous capabilities in developing countries. In addition, there are other ongoing activities relating to the regulation and utilization of space activities.

7. In the area of remote sensing, the United Nations and its specialized agencies have planned a number of international, regional and national training courses and workshops. They cover remote-sensing applications in general as well as specialized topics such as the use of space techniques for monitoring and control of agricultural and desert environments, microwave remote sensing, use of integrated agrometeorological and remote-sensing inputs by regional and national early warning systems on food security in Africa, natural resources management and monitoring, as well as the Geographic Information System (GIS) and remote sensing for sustainable management of the biosphere reserves. Most of these international and regional training courses are jointly organized by two to four organizations within the United Nations system, often in cooperation with other international organizations and/or Governments. National courses on remote-sensing applications are also planned in a number of developing countries. Evaluation missions to establish regional centres for space science and technology education similar to those already undertaken for other regions will be carried out in the Asia and Pacific regions during 1994. Fellowships in the area of remote sensing will also be offered in the 1994-1995 period by a number of international organizations and Member States.

8. Many of the organizations of the United Nations will offer expert services in their respective areas of competence. A number of pilot projects relying on remote-sensing applications include mapping, assessment and monitoring of renewable natural resources and natural disasters, environmental monitoring, desertification control and vegetation monitoring. Also, special projects are being carried out in marine pollution, tropical forest management and assessment of water and fisheries resources. In the area of dissemination of information on remote-sensing technology, organizations either provide information upon request or issue newsletters and technical publications on regional or sectoral development of remote-sensing capabilities. Some organizations have published studies on sustainable development based on forest planning and management.

9. Regarding communications, a number of projects, training courses, workshops and seminars are planned in such areas as the use of communications systems to support primary health care, as well as its use to combat natural disasters and assist in disaster relief operations. Fellowships in the field of communications are also offered through the United Nations system with the cooperation of the agencies of Member States.

10. Various expert and technical advisory services are offered in the planning of global and regional satellite communications systems as well as Earth station projects and satellite communications, navigation and surveillance for international civil aviation. Data and Information Available Now in Africa (DIANA), the satellite communications system, links, on an experimental basis, the Regional Centre for Services in Surveying, Mapping and Remote Sensing (RCSSMRS) at Nairobi, the regional food security early warning

project for countries of the Southern African Development Coordination Conference (SADCC) at Harare, and the Regional Office for Africa of the Food and Agriculture Organization of the United Nations (FAO) at Accra, with the FAO Africa Real Time Environmental Monitoring Information System (ARTEMIS). The DIANA system has demonstrated the capacity of satellite telecommunications systems for real time transmission of large remote-sensing data sets between regions. MERCURE, a project closely allied with DIANA, and which is to start in late 1994, plans to provide global communication coverage for the United Nations Environment Programme (UNEP) for the transfer of information between UNEP headquarters and affiliated centres and between the Global Resource Information Database (GRID) and other archives and users of environmental data. Regional study projects for establishing satellite communications networks are being carried out; one of particular importance is being carried out in the Regional African Satellite Communications System (RASCOM). The United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Telecommunication Union (ITU) are undertaking a study on international telecommunications tariffs that would access tele-informatics applications among countries in different geographical and development areas.

11. The application of satellite technology forms an important element of technical cooperation activities in both meteorology and operational hydrology. A series of workshops and seminars is planned for 1994 and 1995 on various aspects of satellite meteorology and its applications. A number of technical cooperation activities in meteorology and operational hydrology are planned in Member States. Additional activities will focus on the use of space technology for the study of tropical meteorology, tropical oceanography and tropical cyclones.

12. In sectors of development that depend on the application of meteorology and agrometeorology, organizations within the United Nations system, including the Economic Commission for Africa (ECA), UNEP, the United Nations Development Programme (UNDP), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and its Intergovernmental Oceanographic Commission (IOC), FAO and the World Meteorological Organization (WMO), plan a series of activities. The use of data collection and dissemination capabilities on geosynchronous meteorological satellites is growing rapidly. Under the World Climate Research Programme (WCRP), various climate monitoring activities will be undertaken involving the use of satellite data. The recently established Global Climate Observing System (GCOS) and Global Ocean Observing System (GOOS) and proposed Global Terrestrial Observing System (GTOS) will meet the information and data requirements in such areas as monitoring of the Earth climate, climate research and climatological applications to national economies and development. A series of technical reports and publications on activities in other areas such as ozone depletion will be made available.

13. In basic space sciences, the United Nations planned a workshop which was held at Lagos, Nigeria, from 18 to 22 October 1993 for the benefit of ECA member States. Also, a series of fellowships in space research, of a duration of one to three years, will be offered. The United Nations, through its Programme on Space Applications, will continue to collaborate with the Committee on Space Research (COSPAR) to support the space research activities of scientists from developing countries.

14. The work of the specialized agencies of the United Nations is also making significant contributions in new areas of applications of space technology for land, maritime and aeronautical mobile communications. For disaster management, the use of the satellite transceiver for prompt response is being assessed. Further progress is being made towards the development of the Global Maritime Distress and Safety System (GMDSS), which is being introduced in stages and is to be fully implemented at the turn of the century; ships are being encouraged to include satellite equipment. Technical and operating characteristics necessary for compatibility, interoperability and required performance levels for systems in the mobile satellite services are being studied.

15. In the use of mobile satellite services in air navigation, further progress is being made towards establishing air-ground data links for use by air traffic services.

16. In accordance with General Assembly resolution 47/67, the Legal Subcommittee, at its thirty-second session, which was held in New York from 22 March to 8 April 1993, commenced consideration of the question of early review and possible revision of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space (A/AC.105/544, paras. 24-30 and annex I). The Subcommittee also had on its agenda items dealing with matters relating to the definition and delimination of outer space and to the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of ITU (A/AC.105/544, paras. 31-37 and annex II); and dealing with the legal aspect related to the application of the principle that the exploration and utilization of outer space should be carried out for the benefit and in the interest of all States, taking into particular account the needs of developing countries (A/AC.105/544, paras. 38-43 and annex III). Subject to the decision of the General Assembly, the Legal Subcommittee will continue to consider these questions in 1994.

## III. ACTIVITIES PLANNED BY THE ORGANIZATIONS WITHIN THE UNITED NATIONS SYSTEM FOR 1994 AND 1995 AND FUTURE YEARS

### A. Remote sensing and Geographic Information System

#### 1. Education and training programmes

Training courses, workshops and seminars

17. The following training courses, workshops and seminars are being planned by the organizations within the United Nations system in 1994 and 1995:

(a) Fourth United Nations/Sweden International Training Course on Remote Sensing Education for Educators, to be held in cooperation with the Government of Sweden, Stockholm/Kiruna, May/June 1994;

(b) United Nations/European Space Agency (ESA) International Workshop on Microwave Remote Sensing Applications, to be hosted and cosponsored by the Government of China, 1994;

(c) United Nations/ESA Regional Training Course on Remote Sensing Applications to Geological Sciences, for the benefit of member States of the Economic Commission for Latin America and the Caribbean (ECLAC), Peru, June 1994;

(d) United Nations/ESA Regional Workshop on Space Technology to Combat Natural Disasters, for the benefit of member States in the ECA region, Zimbabwe, September 1994;

(e) United Nations/International Astronautical Federation (IAF)/ESA Symposium on Space Technology in Developing Countries, Israel, October 1994;

(f) Fifth United Nations/Sweden International Training Course on Remote Sensing Education for Educators, to be held in cooperation with the Government of Sweden, Stockholm/Kiruna, 1995;

(g) United Nations International Workshop on Remote Sensing Information System, 1995;

(h) United Nations/ESA Regional Workshop on Space Technology to Combat Natural Disasters for the benefit of member States in the ECA region, 1995;

(i) United Nations Regional Training Course on Remote Sensing Applications to Geological Sciences, for the benefit of ECLAC member States, 1995;

(j) United Nations International Workshop on Basic Space Science in Development Programmes for the benefit of member States of the Economic and Social Commission for Asia and the Pacific (ESCAP) and the Economic and Social Commission for Western Asia (ESCWA), 1995;

(k) United Nations/IAF Symposium on Space Technology in Developing Countries, 1995;

(l) ECA/FAO/UNESCO will organize a regional seminar on sustainable development of natural resources taking into account environmental concerns in line with Agenda 21. The seminar will include special sessions addressing the importance and function of satellite imagery and other methods of remote sensing;

(m) The Regional Centre for Training in Aerospace and Surveys (RECTAS) will organize seminars for decision makers, Ile-Ife, Nigeria, October/November 1994 and 1995.

18. The following training courses, workshops and seminars are being planned by ESCAP in 1994 and 1995 with major funding support from UNDP and co-financing and cost-sharing by member countries and other donors:

(a) On-the-job training and study tour to introduce integrated applications of GIS/remote sensing in development planning in July 1994 and August 1995;

(b) Hands-on training for users (including technical personnel in government planning development) on GIS/remote sensing in September 1994 and May 1995;

(c) A workshop on remote sensing and GIS applications to integrated natural resources and environment management in May 1994;

(d) A workshop for planners and policy makers on integrated natural resources and environmental management, and development planning in November 1994;

(e) A seminar for senior planners and managers and decision makers to disseminate information on the operational uses of remote sensing and GIS for integrated natural resources planning, environment management and development planning in February 1996.

19. ESCAP will also organize the following meetings:

(a) A Meeting of Eminent Experts from the Asia-Pacific region to finalize the theme and strategy and coordination mechanisms for the Ministerial-level Meeting on Space Applications for Development, Bangkok, 27-30 October 1993;

(b) A Senior Expert Group Meeting for the finalization of technical and policy-level documentation for the Ministerial-level Meeting, Bangkok, 1-4 March 1994;

(c) A Senior Officials Meeting to develop mechanisms and to formulate a strategy and an action plan preparatory to the Ministerial-level Meeting on Space Applications for Development, Beijing, 19-22 September 1994;

(d) A Ministerial-level Meeting on Space Applications for Development in the Asia-Pacific region, 23-24 September 1994;

(e) The Annual Meeting of the Directors of the National Remote Sensing Centres/Programmes of the ESCAP region, Tehran, May 1994, with host facilities provided by the Islamic Republic of Iran;

(f) The Tenth Session of the Intergovernmental Consultative Committee (ICC) on the Regional Remote Sensing Programme (RRSP), Tehran, May 1994;

(g) The Annual Meeting of the Directors and the Eleventh Session of ICC, Bangladesh, 1995.

(h) The Annual Meeting of the Directors and ICC, Malaysia, 1996.

20. The following activities on RRSP regional networks will be organized by ESCAP/RRSP with major funding from UNDP and cofinancing and cost-sharing by member countries and other donor agencies:

(a) Expert Group Meetings to review the operational strategy, operational structure, and financial and managerial mechanisms for the RRSP network, February 1995;

(b) A Network Meeting to prepare guidelines to operationalize the regional information, training and education networks, July 1995;

(c) A Senior Officials Meeting to endorse the report on the regional network's mechanisms and strategies for self-sustainability, 1996.

21. FAO plans to organize or co-organize the following remote-sensing training courses, workshops and seminars in 1994 and 1995:

(a) FAO/European Community (EC)/ESA Regional Workshop for Decision Makers on Agricultural and Environmental Applications of Remote Sensing and GIS in the Near-East Region, Tunis, 10-14 January 1994, in cooperation with Telespazio (Italy) and hosted by the Centre national de télédétection (CNT) (Tunisia);

(b) UN/FAO/Group for the Development of Aerospace Remote Sensing (GDTA) (France) Training Course on Agricultural and Environmental Applications of Remote Sensing and GIS, Ile-Ife, Nigeria, 14-25 March 1994, hosted by RECTAS;

(c) UN/FAO Training Course on Remote Sensing Applications in Arid and Semi-arid Zones, Damascus, 1995, hosted by the General Organization of Remote Sensing (GORS) of the Syrian Arab Republic;

(d) FAO/German Foundation for International Development (DSE) International Training Course on Applications of Remote Sensing and GIS in Environmental and Natural Resources Management and Monitoring, Feldafing, Germany, 6 June-1 July 1994;

(e) FAO/EC/ESA Regional Workshop for Decision Makers on Agricultural and Environmental Applications of Remote Sensing and GIS in the Central/Eastern European Countries, Romania, 12-16 September 1994, in cooperation with Telespazio (Italy);

(f) FAO Regional Training Course on Applications of Remote Sensing and GIS to Inland Fisheries, Latin America, 2 weeks in October 1994;

(g) ECA/FAO Workshop on Vegetation Cover/Land Use Map and Geographic Database of Africa based on Remote Sensing, Addis Ababa, 23-27 May 1994;

(h) FAO Expert Consultation on Agricultural Crop Assessments based on Integrated Agrometeorological and Remote Sensing Inputs, Rome, 1994;

(i) FAO/EC/ESA Regional Workshop for Decision Makers on Agricultural and Environmental Applications of Remote Sensing and GIS in the Central/Eastern European Countries, Warsaw, 23-27 May 1995, in cooperation with Telespazio (Italy) and hosted by the National Remote Sensing Centre of Poland (OPOLIS);

(j) FAO/EC/ESA Regional Workshop for Decision Makers on Agricultural and Environmental Applications of Remote Sensing and GIS in the Near East Region, one week, venue and dates to be determined, in cooperation with Telespazio (Italy);

(k) DSE (Germany)/FAO Regional Training Course on Applications of Remote Sensing and GIS in Managing Tropical Forests and Conserving Natural Resources in Southeast Asia, Kuala Lumpur, one month, dates to be determined, hosted by the Asian Institute of Forest Management (AIFM);

(l) FAO Regional Training Course on Applications of Remote Sensing and GIS to Aquaculture in Africa, two weeks, venue and dates to be determined;

(m) FAO Expert Consultation on Tropical Forest Cover Assessment and Monitoring based on Remote Sensing and GIS, Rome, 1995;

(n) FAO Expert Consultation on Remote Sensing inputs to Environmental Monitoring at Regional Levels, Rome, 1995.

22. ECA will cooperate with the Office for Outer Space Affairs in the establishment of the Regional Space Sciences and Technology Education Centres for Africa.

23. Training in the fields of remote sensing and GIS will continue to be one of the most important activities at the RCSSMRS. Short courses of three weeks to three months will remain the focus of the training programmes. As RCSSMRS is experiencing an overwhelming demand for GIS training, a number of courses have been planned for the 1994-1995 biennium. Several donor countries and agencies are sponsoring such activities.

24. RECTAS, at Ile-Ife, Nigeria, will continue to offer long-term training courses, ranging in duration from 10 to 22 months, in photogrammetry and remote sensing at the technician, technologist and post-graduate levels. These courses, in English and French, will cover techniques of natural resource exploration, exploitation and management, environmental monitoring, control and protection as well as planning for accelerated, orderly development and the provision of infrastructural and social services. The Centre will also shortly begin offering cartography courses as well as GIS and LANDSAT Information System (LIS).

25. RECTAS also periodically organizes workshops, conferences and seminars to meet the needs of governments and organizations, and plans to publicize its activities aggressively to encourage more ECA member States to take advantage of the facilities of the Centre to train African nationals.

26. RECTAS plans to expand its facilities and capabilities in order to participate actively in the coordination of outer space activities for the African continent.

27. The Ouagadougou Regional Remote Sensing Centre (CRTO) will offer the following training courses in 1994:

(a) Two 10-month postgraduate courses entitled "Regular Remote Sensing Cycle comprising Technology, Applications and Specialization";

(b) Three-month courses on GIS organized in cooperation with the Global Environmental Monitoring System (GEMS)/United Nations Institute for Training and Research (UNITAR), for engineers, researchers and high-level technicians from member States;

(c) Short practical training courses (June-August), entitled "Introduction to Remote Sensing for Educators", for participants from schools with academic programmes on environmental education.

28. UNITAR training programmes in GIS, remote sensing and image processing for management of natural resources and the environment, ongoing for six years, are conducted with UNEP, the Swiss Ecole polytechnique fédérale de Lausanne, the Graduate School of Geography, Clark University, United States, and the Environmental Systems Research Institute (ESRI) of Redlands, California. UNITAR will conduct the following courses in 1994 and beyond:

(a) Introductory and advanced GIS workshops, in cooperation with the International Centre for Integrated Mountain Development (ICIMOD) and ICIMOD's Mountain Environmental Natural Resource Information Systems (MENRIS), Kathmandu, 1994;

(b) The GEMS/UNITAR/United Nations Sudano-Sahelian Office training programme in GIS and GIS-related topics for scientists and planners from member States of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) at the AGRHYMET centre, Niamey, 1994;

(c) UNITAR seminar relating GIS to health topics, in cooperation with the São Paulo municipality and the Italian Development Cooperation, São Paulo, Brazil, 1994.

29. UNEP, as an Earthwatch activity, will continue its efforts in 1994-1995 and beyond to establish and maintain Environment Information System (EIS) capabilities and networks to support the decision-making process at national, subregional and global levels for sustainable use and development of natural resources (see A/AC.105/524, para. 22).

30. UNEP regional programmes on EIS networks will attempt to revitalize in 1994 the AGRHYMET programme, which came to an end in December 1992 due to shortage of funds (see A/AC.105/524, para. 23).

31. UNEP, through its GEMS and GRID programme activity centres, plans (if funds become available) to establish a sub-regional environment information network for SADCC 10-member states and SADCC-Environment and Land Management Sector (ELMS) Coordination Unit. The components of the programme, which is expected to be implemented in 1994-1995, include an environment information training programme involving GIS and satellite Image Processing (IP), and creation and distribution of a regional resource database using remotely sensed data.

32. UNESCO by itself or in cooperation with the International Labour Organisation (ILO) and the World Intellectual Property Organization (WIPO) will undertake various actions to encourage further ratifications and acceptance of the Convention Relating to the Distribution of Programme-carrying Signals Transmitted by Satellite. The search for solutions of the copyright and neighbouring rights problems raised by the use of satellites for broadcasting purposes will remain one of the concerns of UNESCO.

33. UNESCO and ITU are undertaking an international study on telecommunication tariffs, including satellite networks, to consider problems of access to tele-informatics applications in and between countries in different geographical and development situations in the areas of education, science, culture, and communications (including academic and research networks, distance education, access to specialized databases and documents, and media needs). The study will be published in 1994.

34. UNESCO will organize in 1994, in cooperation with the Kenya National Committees of the International Hydrological Programme (IHP) and the Man and the Biosphere (MAB) Programme, and with the International Institute for Aerospace Survey and Earth Sciences (ITC), a regional seminar and training courses on GIS and remote sensing for sustainable management of the biosphere reserves. Also planned is an in situ GIS training course in one biosphere reserve in China.

35. At UNESCO, IOC organizes regional training courses on the applications of satellite remote sensing to marine studies, making use of the computer-based learning modules; these training courses will continue in 1994 and beyond.

36. The United Nations Industrial Development Organization (UNIDO) plans to promote, in cooperation with the Government of India, training for decision makers and technicians in the area of remote-sensing applications focusing on identification, classification and monitoring of raw materials resources.

Fellowships

37. The United Nations Programme on Space Applications, with the assistance of Brazil, China, Greece and ESA, provides long-term fellowships in different aspects of space science and technology for candidates from developing countries to undertake in-depth education (see A/AC.105/534).

38. ECA, in support of human resources development in remote sensing and GIS in Africa, will continue to solicit fellowships from the agencies within the United Nations as well as other donor countries and agencies.

39. RECTAS will provide student fellowships to its member States through projects funded by EC and the Governments of France and the Netherlands until 1994. The projects are co-executed by ITC and GDTA, and implemented jointly with RECTAS.

40. ESCAP will organize advanced training for up to 15 professionals trained as trainers in general principles and applications of GIS and remote sensing through 9- to 12-months long-term fellowship studies. There will be at least five fellowships each year in 1994, 1995 and 1996. The training will be arranged by participating countries on a cost-sharing basis with the ESCAP UNDP-funded project on GIS and remote sensing (RAS/92/070).

41. In the next few years, UNESCO will support the following postgraduate training courses dealing with the applications of remote sensing to integrated natural resources research, management and development:

(a) Postgraduate course in integrated study and rational use of natural resources at the universities of Paris, Montpellier and Toulouse, France;

(b) International postgraduate training courses on remote-sensing applications, digital image processing and aerospace surveys for applied geomorphology and engineering geology will be conducted at ITC, Enschede, Netherlands;

(c) An international postgraduate training course on photo-interpretation applied to civil engineering and to geology will be given at the Instituto Geográfico Agustin Codazzi, Santa Fe de Bogotá, Colombia;

(d) The Training and Education in Marine Science (TREDMAR) Programme of UNESCO will release in 1993 its fourth and fifth computer-based learning modules on "Applications of Marine and Coastal Image Data - from satellite, airborne and in situ sensors". Planned for 1994 is a CD-ROM containing all of the existing lessons of the series with pertinent modifications, enhancements and local variations suggested by the users. The first module with lessons in the Windows version of the BILKO software is scheduled for 1995. The overall objective, to help strengthen international satellite-oceanography training and education, is gradually being realized through the growing network of users and producers of the lessons. At present, this virtual global faculty consists of people from about 500 universities, government services and companies in 70 countries who are using the modules for teaching, continuing education and as a research tool. Their feedback, especially new lessons, provides the project with a strong basis for future developments;

(e) UNESCO, within the framework of IHP and in cooperation with FAO and ITC, organizes training courses on the use of remote-sensing images and GIS in water resources studies;

(f) Within UNESCO, IOC organizes regional training courses on the applications of satellite remote sensing to marine studies, making use of the aforementioned computer-based learning modules; these training courses should continue in 1993 and beyond.

42. FAO will continue providing fellowships and organizing study tours within the framework of remote-sensing technology transfer activities of field projects.

### 2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects

Provision of expert services

43. The United Nations Programme on Space Applications is working closely with the Government of Ecuador, on request, to promote cooperation between that Government and the Governments of the countries that are within the coverage area of the Cotopaxi Ground Receiving Station by means of appropriate consultations. At the request of the Government of Ecuador, the Programme organized a mission to Colombia, Ecuador, Peru and Venezuela, which included representatives of suppliers of data and equipment. The mission recommended that the Governments of the Andean Presidential Council should take steps to establish working groups which would: strengthen the use of data from the Station through national or regional projects; determine and advise the Governments on the necessary technical upgrades to the Station; undertake other short- and mid-term actions necessary to guarantee the continuous operation of the Station and the maintenance of a regional data archive.

44. The United Nations Programme on Space Applications assisted in the planning and organization of the Second Space Conference of the Americas held at Santiago from 26 to 30 April 1993. In collaboration with member States in the region, the Programme on Space Applications prepared a document on the contributions that space technology can make towards sustainable development, and highlighted space activities by the United Nations with regards to meeting the goals of Agenda 21 in Latin America and the Caribbean.

45. The Conference produced a Santiago Declaration which established a temporary Secretariat to follow up and provide continuity to the outcome of the Conference. At the request of the Government of Chile, in its capacity as host to the headquarters of the temporary Secretariat, the Office for Outer Space Affairs will provide support to follow up the recommendations of the Conference. In particular, the Office for Outer Space Affairs will coordinate, as may be necessary, the support of the United Nations system.

46. ECA will expand the undertaking of advisory missions to member States and subregional and regional institutions, including economic groups. In this respect, it is anticipated that, as a result of the decentralization process within the United Nations system and the need for ECA to bridge the hiatus in its capacity to provide these services, a remote-sensing officer will be transferred from headquarters to the African Regional Commission.

47. The provision of technological and administrative advisory services to the regional centres and other ECA-sponsored organizations offering training or consultancy services in the sphere of remote sensing will equally be enhanced. In particular, the Commission will pursue, with special emphasis, its efforts towards the harmonization and rationalization of the regional centres in order to avoid waste of resources, duplication of functions and confusion, and to reduce the financial burden that they may constitute to their member States.

48. ECA will convene two ad hoc expert group meetings for the development of natural resources and energy in Africa. The role played by remote sensing and GIS technologies will be a major item of the terms of reference of the expert group meetings.

49. ESCAP staff members will provide the following technical and advisory services to the region:

(a) Technical advisory service and consultative missions will be undertaken in the member countries on the use and applications of GIS/remote sensing in integrated natural resources and environment management. Approximately 8 to 10 such missions will be conducted each year in 1994 and 1995 at the request of the member countries;

(b) Consultative meetings with missions to donor agencies will be conducted to arrange the cost-sharing and cofinancing of regional GIS/remote sensing activities during 1994 and 1995.

50. RCSSMRS will continue to provide advisory services to member countries in the establishment and strengthening of national remote-sensing units. The strength of technology transfer depends on the ability of member countries to utilize the data for planning and decision-making on a daily basis. In addition, RCSSMRS has submitted a project to EC for funding. This project has a big component on remote-sensing to strengthen national remote-sensing units.

51. RCSSMRS is strengthening its GIS capabilities for the analysis and assessment of natural resources data. In this regard, it will establish a GIS centre to facilitate the training of participants from the Eastern and Southern Africa subregion. Image-processing systems have been acquired through the French Technical Assistance. The system consists of Didactim, Multiscope and Alliance. A GIS specialist post has been created to complete the required staff.

52. UNEP through its GRID-Sioux Falls facility is carrying out a bi-annual comprehensive survey of GIS and satellite image-processing software systems. The first survey was carried out for the baseline year 1991, and the report was widely distributed within the United Nations system and developing countries. The activity will be repeated every two years to provide up-to-date information to the member countries.

53. UNEP/GRID will publish a manual on "Environmental GIS and IP: With Special Reference to Developing Countries". It is expected that this publication will provide understanding of basic principles of GIS and IP, increase familiarity with the available software tools, and impart practical tips for the project design using GIS and IP. The manual will be produced in cooperation with Clark University, of Worcester, Massachusetts, and the United States Agency for International Development (USAID), and will be distributed within the United Nations system and developing countries.

54. UNEP, through its GRID-Sioux Falls facility, will produce a comprehensive analysis of data policies of current and planned satellite systems. The aim is to provide market intelligence to United Nations agencies and developing countries and guide them in formulating suitable strategies for purchase of commercial products of different satellite systems.

55. UNEP, through its GRID Programme Activity Centre, is sponsoring jointly with UNESCO an expert consultation to examine the needs and review the modalities for the establishment of an Arab Environmental Information Network to include remotely sensed data. A series of country visits are being consolidated into a regional overview.

56. The FAO Remote Sensing Centre (FAORSC) annually provides technical support, including advisory services, formulation, backstopping and evaluation of field projects to about 50 developing countries in Africa, Asia, Latin America and the Caribbean, and in Central and Eastern Europe.

57. FAO will continue to cooperate with United Nations regional economic commissions and regional remote-sensing centres in the efficient use of appropriate remote-sensing technology for the mapping, assessment and monitoring of renewable natural resources and natural disasters. The priorities of this assistance will follow the Agenda 21 recommendations of the United Nations Conference on Environment and Development (UNCED).

58. FAO is assisting in developing a Nile forecasting centre within the Ministry of Public Works and Water Resources at Cairo to monitor and forecast the flows of the Nile River and its tributaries. The project, which is funded by USAID is designed to assist Egyptian planners in the more effective regulation of the Nile waters stored in Lake Nasser, with an integral part involving the real-time receipt and processing of environmental satellite data for precipitation estimation. The project is being carried out with the National Weather Service of the United States National Oceanic and Atmospheric Administration (NOAA) as a subcontractor for the development of hydrological models. Primary Data Users Stations (PDUS) and Meteosat Data Dissemination (MDD) stations were installed at the Nile Forecasting Centre at Cairo, and are operating on line with a computerized hydrological forecasting model based on the application of GIS technology. It is foreseen to expand the geographical coverage of the model to include the whole Nile River basin.

59. The FAO Fisheries Department plans to install a satellite ground receiving station for NOAA-advanced very high resolution radiometer (AVHRR)-local area coverage (LAC) image data. The station will be used for satellite limnology, in support of the FAO/Finnish International Development Agency (FINNIDA) project entitled "Research for the Management of Fisheries on Lake Tanganyika".

60. FAO will continue its assistance to the Government of Afghanistan in preparing for the rehabilitation of the agricultural sector through an inventory of current land utilization based on satellite remote sensing and GIS technologies. Such assistance will also be provided to the Islamic Republic of Iran. Similar projects have been prepared for the Libyan Arab Jamahiriya and Mozambique.

61. FAO will implement phase II of its regional remote-sensing/food security early warning project for the SADCC countries, with possible funding by the Government of the Netherlands, and is exploring the

continuation of its sister project for the countries of the Intergovernmental Authority on Drought and Development (IGADD).

62. FAO continues to assist the Government of Buenos Aires Province, Argentina, in strengthening its Remote Sensing Centre and capacity for agricultural applications of remote sensing.

63. FAO will continue to promote cooperation between Latin American countries in agricultural and environmental applications of remote sensing and GIS through active participation in Space America conferences and provision of advisory services. FAO will also assist in preparing a project proposal for the establishment of a regional remote-sensing institutional network for Latin American Countries.

64. FAO will assist with the preparation of a project proposal for the establishment of a subregional remote-sensing institutional network for Caribbean Countries.

65. FAO will continue its assistance to countries in the Caribbean subregion in establishing land information systems based on aerial photography, satellite remote sensing and orthophoto mapping. At present such assistance is being provided to Barbados, Belize and Trinidad and Tobago.

66. FAO continues to assist the countries of Central Europe in increasing their capacities for agricultural and environmental applications of remote sensing and GIS. In particular, FAO will continue to offer advice on the use of remote sensing and GIS in planning and implementing agricultural land reform and in the assessment and monitoring of environmental damage. At present, such assistance is being provided to Albania, Czech Republic, Hungary, Poland and Slovakia.

67. World Bank activities in remote-sensing technology are focused on the application of satellite imagery incorporating remote sensing and GIS technology as small subcomponents of larger World-Bank-funded projects. The World Bank applies remote-sensing technology to project-specific activities and also to selected national survey and mapping problems, including the preparation, implementation and supervision of many projects in all development fields. These are pursued through three inter-related areas.

68. The World Bank Centre for Earth Resource Assessment (CERA) facilities and staff have been relocated to different regions where the following activities have been undertaken:

(a) The Asia GIS and remote-sensing facilities developed a strong programme to support natural resource and environmental projects in the Asian region;

(b) An African programme to support member countries in developing their own national environmental information service;

(c) The establishment of a small multi-donor secretariat in the African Regional Environmental Division to support an international advisory committee;

(d) The establishment of two small project-based technical teams in Latin America and the Middle Eastern regions.

Study and pilot projects

69. The United Nations Department of Economic and Social Development (DESD) will continue to include and use new methodologies for resources exploration and studies related to the application of sophisticated digital image processing in response to requests from the Committee on Natural Resources. Also, in response to requests of Member States, DESD will continue to assist in the design, execution and financing of remote-

sensing projects that have training, consultancy and delivery of equipment as major components. With respect to operational activities, DESD will further provide its technical advisory services and project execution.

70. ESCAP will conduct studies and surveys to prepare the following training materials, guidelines and inventories on regional remote sensing and GIS development:

(a) A manual oriented to planners and decision makers and trainers on applications of GIS/remote sensing to natural resources and environmental management in 1994-1995;

(b) A set of guidelines for standardization of GIS/remote-sensing information in coordination with socio-economic data for development planning in 1994-1995;

(c) An inventory of facilities and a roster of specialists involved in GIS/remote sensing for natural resources and environment management and development planning during 1994-1995;

(d) A monograph on the special applications of GIS/remote sensing for natural resources and environment management in the Asia and Pacific region.

71. ESCAP, through its RRSP, will arrange six pilot projects to customize GIS/remote sensing for operational use in integrated natural resources and environment management and in development planning. Two of the pilot projects will be initiated in 1993 and continue until 1994. Two more will be started in 1994 and continue until 1995. A third set of two pilot projects will be initiated in 1995 and end in 1996.

72. Environmental monitoring at the global, regional, national and local levels require new and innovative approaches for the analysis of multi-source, multi-scale, and multi-temporal spatial datasets. There is a pressing need for establishing a base of scientifically proven analysis techniques to support environmental sensing using remotely sensed data. UNEP through its GRID-Sioux Falls facility will cooperate with scientists of the Earth Resources Observation Systems (EROS) Data Centre in the development of algorithms and techniques for change detection using remotely sensed data in support of operational programme needs.

73. UNEP, in cooperation with FAO, through its GRID-Geneva facility will continue its work aimed at merging existing forest/non-forest 1 km AVHRR datasets into a global coverage (see A/AC.105/524, para. 55).

74. UNEP through its GRID-Sioux Falls facility is collaborating with the United States Geological Survey (USGS) and others in the development of a Global Land Cover Characteristics Database using AVHRR 1 km data from NOAA polar-orbiting satellites. This will also include ancillary data, on such matters as elevation, ecoregions, climate and soils. The tasks involved are AVHRR time-series data assembly, ancillary data collection, interpretation, validation/evaluation and product generation. The plan is to complete a global land-cover characteristics database within the next couple of years. Current plans for continental analysis are based on the following timetable: North America by December 1994; South America by December 1994; Africa by December 1995; Australia and Oceania by December 1996; and Eurasia by December 1998.

75. UNEP's GRID-Bangkok and GRID-São José dos Campos (Brazil) facilities are also contributing to this cooperative effort. Other United States agencies cooperating in this project are the National Aeronautics and Space Administration (NASA), NOAA, the Environmental Protection Agency (EPA) and the Forest Service. The UNEP contribution will also include:

(a) Establishment of regional expert panels to develop suitable classification systems and evaluate the accuracy and utility of national, continental and global data sets being developed under land cover characterization studies;

(b) Development of an appropriate statistical sampling strategy for validation of results at national, continental and global levels. Work related to the review of applications of NOAA-AVHRR 1 km data for environmental monitoring and creation of AVHRR Normalized Difference Vegetation Index (NDVI) composites for Mexico for May-June 1990 have been completed;

(c) Development of algorithms and techniques for the automatic identification and extraction of various phenologically indicative parameters from time series of 1 km AVHRR NDVI composites.

76. The UNEP/GRID Programme Activity Centre in cooperation with NASA and the United States Geological Survey (USGS) will implement the project funded by the Global Environment Facility (GEF) entitled "Central Africa - Acquisition and Distribution of Comprehensive LANDSAT TM Satellite Imagery". The project will provide satellite data for GEF biodiversity projects in Central Africa and environmental data for national planning and state of the environment (SOE) reporting by Central African countries.

77. UNEP, through its GRID-Bangkok facility will continue to develop further forest/non-forest classification of the region covered from longitudes 81 East to 120 East and from latitudes 29 North to 10 South. This activity is designed to provide regional support to FAO and the EC Tropical Ecosystem Environment Observations by Satellite (TREES) project, and will contribute to UNEP efforts in the development of a global forest/non-forest database. As a part of this exercise, LANDSAT Thematic Mapper (TM) images of certain selected areas will be processed to verify the AVHRR classification, and this activity is expected to continue in 1994 (see A/AC.105/524, para. 57).

78. UNEP, through its regional office for Europe, and GRID-Geneva and GRID-Warsaw facilities will carry out a forest damage assessment project for Central and Eastern European countries (Black Triangle), entitled "Large-Area Operational Experiment for Forest Damage Monitoring in Europe Using Satellite Remote Sensing". The project, which will continue in 1994-1995, will use LANDSAT-TM images.

79. UNEP cooperation with the International Board for Plant Genetic Resources (IBPGR) will continue in 1994-1995 (see A/AC.105/524, para. 58).

80. UNEP through its Desertification Control Programme in association with the Institut géographique national (IGN) and the University of Reims, France, undertook in West Asia a 5-year project for developing a methodology for assessment of desertification in the South Saharan Arid, Semi-arid and Sub-humid Ecozones between 1987 and 1992. This includes analysis and comparison of aerial photographs and Experimental Earth Observation Satellite (SPOT) and NOAA satellite imageries over transects covering areas of Mauritania, Mali, Burkina Faso and Niger. A new phase of the project for further defining the methodology is anticipated during the 1994-1995 biennium.

81. UNEP, through its Desertification Control Programme, will carry out the following projects during the 1994-1995 biennium using remotely sensed data:

(a) National land degradation assessment and mapping in Kenya (in collaboration with the governments of Kenya and the Netherlands);

(b) Qualitative and quantitative assessment and mapping of desertification in two countries in the ESCAP region (in collaboration with national governments and ESCAP).

82. UNEP cooperation with the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) will continue in 1994-1995.

83. UNEP efforts, through the Norwegian national GRID-Arendal facility, in developing a GIS database of the Baltic Sea catchment area will continue in 1994-1995 (see A/AC.105/524, para. 62).

84. UNEP, through its Soils programme, will continue Soils and Terrain database (SOTER) activities in 1994-1995 (see A/AC.105/524, para. 63).

85. UNESCO and ITC will complete the implementation of the ongoing cooperative programme "Geoinformation for environmentally sound management of natural resources" in 1994, which involves activities concerning the application of GIS and remote sensing and training in the fields of ecology, hydrology and geology.

86. Within the framework of the MAB programme and in cooperation with the National Institute for Research in the Amazon (INPA-Brazil) and the Institut français de recherche scientifique pour le développement et Coopération (ORSTOM-France), UNESCO is developing a multidisciplinary research programme on the economic and ecological sustainability of tropical forest management in the Central Amazonia region. Remote-sensing technologies will be used for natural resource surveying and mapping.

87. UNESCO will establish a remote-sensing centre at the Libyan Secretariat for Scientific Research, within the framework of a research project aimed at studying the natural resource potential in the south of the Libyan Arab Jamahiriya. FAO will cooperate in establishing the centre relating to agricultural applications.

88. UNESCO, in cooperation with the Center for Remote Sensing of Boston University, United States, will assist the Omani authorities in establishing a geographical information system and a digital image-processing laboratory.

89. IOC (UNESCO), in cooperation with the Norwegian GRID-Arendal facility, will continue to develop marine data information systems.

90. UNESCO, with the International Union of Geological Sciences (IUGS) and the Royal Museum of Central Africa (Belgium), will implement the third phase of the Geological Applications of Remote Sensing (GARS) Africa project, which aims at developing a remote-sensing user network in Burundi, Rwanda, Uganda, the United Republic of Tanzania and Zambia. UNESCO will also implement, together with IUGS, a new phase of the GARS Latin America project on the use of microwave space-borne sensor data for the mitigation of natural hazards in the Andean region.

91. The WHO programmes in tropical diseases research, control of tropical disease and environmental health continue to investigate the opportunities offered by remote sensing for improving research and control of vector-borne diseases. The Joint WHO/FAO/UNEP/United Nations Centre for Human Settlements Panel of Experts on Environmental Management for Vector Control (PEEM) plans to promote, together with the USAID Vector Biology and Control Project, based in Washington, D.C., the incorporation of health information and remotely sensed data on health determinants into a GIS for integrated river-basin management in Morocco.

92. The information system of the WHO Division of Emergency Relief Operations is being strengthened and adapted to country needs following a pilot study launched in India in 1992. In addition, the Pan-African Centre for Emergency Preparedness and Response at Addis Ababa has developed a mapping project to monitor the emergency situation in Africa using the statistics obtained from the database system. The mapping project is intended to assist managers working in the preparedness and response areas.

93. FAO and ESA will continue their cooperation in developing appropriate techniques for the applications of satellite synthetic aperture radar (SAR) imagery to agriculture and forestry in developing countries. Similar cooperation has started with the Canada Centre of Remote Sensing (CCRS).

94. FAO is continuing cooperation with the Government of France in developing operational methodologies for applications of high-resolution remote-sensing data in international development projects through implementation of pilot studies. Their results are published in new FAORSC series of technical publications and brochures for decision makers.

95. FAORSC has cooperated with the Dutch National Aerospace Laboratory (NLR) and the Agricultural University of Wageningen on implementation of a feasibility study on "A global operational forest cover monitoring network based on satellite remote sensing". It will be followed by other feasibility studies as required by the FAO Global Forestry Resources Assessment 1990 (FRA90) project.

96. FAO will also continue its study on the use of time series of ARTEMIS vegetation assessments to improve estimates of the length of the growing period and its variations, particularly in the Sahel region.

97. FAORSC will continue its cooperation with the FAO divisions responsible for sustainable management of agricultural, forestry and fisheries natural resources and for the FAO Global Information and Early Warning System on Food and Agriculture (GIEWS) on increasing use of remote-sensing inputs and their integration with other inputs in GIS.

98. FAORSC will continue to cooperate with the FAO Forestry Department in the assessment of existing forest resources and trends in deforestation, forest degradation and plantations. A number of pilot studies will be undertaken to test new data and to develop appropriate methodologies.

99. In the framework of FAO inputs to the ongoing and planned global environmental programmes such as the GTOS, FAO will continue its cooperation with organizations within the United Nations system, specialized agencies and other international organizations in providing remote-sensing expertise and in participating in pilot studies in areas within its mandate.

100. UNEP will continue in 1994 through its water programme to cooperate in the assessment of water resources in the ESCWA region (see A/AC.105/524, para. 79).

101. UNEP, through its Ocean and Coastal Areas Programme Activity Centre and GRID-Nairobi facility, with funding from the Belgian Government is carrying out the development of a marine and coastal zone database and atlas for East African countries to provide information for coastal zone management purposes. This work is largely based on classifications derived from LANDSAT-TM images and will continue in 1994.

102. UNEP, through GEMS and GRID, will continue to contribute to the work of the Committee on Earth Observation Satellites (CEOS) user group (see A/AC.105/524, para. 82).

103. UNEP's GRID cooperating centres in Poland (GRID-Warsaw) and Brazil (GRID-São José dos Campos) will continue to play a significant role in national environmental problem-solving using remote sensing and GIS (see A/AC.105/524, para. 83).

104. UNEP's GEMS Programme Activity Centre, as part of its ongoing activities within the framework of Earthwatch related to the status of the African elephant throughout its range, is fostering usage of satellite-based positioning technology during surveys of elephant populations and their behaviour in Kenya. Traditional aerial survey techniques have been augmented by real-time use of Global Positioning System (GPS) receivers on aircraft and vehicles to provide accurate spatial coordinates for herds as they are

being counted. In addition, members of some herds have been fitted with radio transponders which, when interrogated during daily overpasses of INMARSAT platforms, provide regular spatial coordinates for the herds, by which their movements between and around farming communities are monitored.

105. The IGADD and SADCC countries, in collaboration with FAO and supported by funding from the Government of the Netherlands and UNEP, are continuing to provide early warning systems for food security programmes in the subregion. Through this project NDVI maps will continue to be produced regularly as essential tools for planners and decision makers in the Eastern and Southern African subregion. With the provision by the French Government of a microwave receiving station for direct reception of NOAA-AVHRR data from the Kenya Meteorological Department to RCSSMRS, countries of the region will easily exchange information and data on climatic changes for better crop planning and yield forecasting.

106. RCSSMRS has developed a project in collaboration with EC, France and the Netherlands to conduct pilot projects in the States of the Eastern and Southern African subregion for three years. The development of pilot projects is a new strategy in helping indigenous nationals to participate in remote-sensing activities. The pilot projects will be suitably designed so as to involve donor agencies and international organizations.

107. RCSSMRS in cooperation with UNEP will continue to host the IGADD/FAO regional remote-sensing project on Early Warning Systems for Food Security programme in the subregion. Through this project, NDVI maps are regularly produced for use by planners and decision makers in the subregion. Data on rainfall estimation in 10-day intervals is regularly produced and posted to the IGADD member countries. The Government of France has provided a microwave receiving station for direct reception of NOAA/AVHRR data from the Kenya Meteorological Department and the RCSSMRS. Phase II of the project is planned to last three years, and is expected to commence in early 1994.

108. The DIANA system, which was launched at RCSSMRS in July 1992, fast and effectively transmits and receives ARTEMIS data to and from Accra, Harare and Nairobi. It is proposed that UNEP consider the inclusion of DIANA in the early phase of MERCURE.

109. RECTAS has executed or is planning the following studies and projects:

(a) With the National Electricity Power Authority of Nigeria, in 1992, the Definition and Characterization of High Voltage Electricity Transmission Line Route from Enugu to Makurdi over a distance of about 250 kilometres for environmental impact assessment, under World Assistance Project funding, using SPOT Imagery;

(b) With the Instituto di Architettura E Urbanistica, Trieste, Italy, a land use study of urban and contiguous rural areas of Ile-Ife region, using space imagery;

(c) With the University of Hamburg and the University of Agriculture, Abeokuta, providing land use maps and hydrological information, using space imagery, for the Ogun River Basin Project;

(d) With the Osun State Development Corporation, a project on Land Use and Vegetation Inventory and Environmental Impact Assessment in Osun State, using space imagery;

(e) With the Centre for Energy Research and Development, the Organization of African Unity and Universities in the United States (the University of California at Berkeley, the Massachusetts Institute of Technology etc.) a project entitled "Greenhouse Gas Emission Radiation in Nigeria", under Environmental Effect Studies, in line with UNEP Agenda 21. RECTAS will carry out the image processing analyses and interpretation of all the space imagery.

110. RECTAS is also planning in the future:

(a) For the African Development Bank's West Africa Long Term Prospects Study, the provision of remote-sensing inputs for the study of population, development and environment impact;

(b) A RECTAS-Bureau de recherche géologique et minière (BRGM) (France) project, "Geological Maps Revision of Nigeria", with space data and the image processing, analysis and interpretation of the space imagery to be used;

(c) A RECTAS-Forest Research Institute of Nigeria project, in which RECTAS will lend assistance in the processing and interpretation of LANDSAT multispectral scanner (MSS) data for the study of vegetation and forestry.

111. ECA, in cooperation with the Joint ECA/FAO Agriculture Division (JEFAD), will publish a study on geographic and land information systems for land resources, with special attention to forest planning and management within the perspective of sustainable development.

112. Among the various development projects that ECA is formulating to be submitted to various donor agencies under the intercountry programme for Africa and to other donors, special attention will be placed on "Integrated development of River Basins and Lake Basins in Africa" for a period of five years. This programme contemplates the development and establishment, for some selected river basins, of a usable up-to-date geo-referenced land information database containing both conventional and remote-sensing data. An Environmental Information System (EIS) would be built to handle the data.

113. FAO is continuing to cooperate with the United Nations International Drug Control Programme on pilot projects to determine narcotic drug plantations from satellite remote-sensing data. This cooperation has yielded the most promising results and is being expanded. Planned studies will use high-resolution data from new optical and microwave Earth observation satellite systems. Increased use of GIS and expert systems for modelling and forecasting is also planned.

114. The Department of Humanitarian Affairs (DHA) (which has taken over the functions of the Office of the United Nations Disaster Relief Coordinator) will continue to cooperate with organizations within the United Nations system and other specialized organizations in the study on a practical use of remote-sensing control for disaster management. The secretariat of the International Decade for Natural Disaster Reduction (IDNDR) will continue to promote activities for the application of remote sensing in reducing the human and national development costs of disasters.

115. The Indian Ocean Marine Affairs Cooperation (IOMAC) programme, in collaboration with the United Nations Office for Outer Space Affairs, is planning to undertake small-scale feasibility projects of satellite remote-sensing applications for mapping, monitoring and management of coastal resources (see A/AC.105/465 and Corr.1, para. 67).

### 3. Dissemination of information on the status of technology

#### Continuing activities

116. Since 1989, the United Nations Space Applications Programme has published an annual collection of papers selected from among those presented at the meetings, workshops and training courses organized under its auspices. The publication, entitled Seminars of the United Nations Programme on Space Applications: Selected Papers on Remote Sensing, Satellite Communications and Space Science, covers different aspects of space science and technology. It includes papers that are broad in scope and are of enduring interest. As

of 1993 four of these publications had been completed, and the 1994 edition will contain manuscripts concerning remote sensing from the activities of the Programme conducted in 1993 at the following locations: ESA/European Space Research Institute (ESRIN) at Frascati (Italy); Stockholm University and the SSC Satellitbild at Kiruna, Sweden; Bandung, Indonesia; Dakar; Mexico City; and Kathmandu.

117. ESCAP will assist in strengthening 15 nodal points of national information networks by December 1995 to make the Regional Information Service (RIS) network of RRSP operational.

118. ESCAP will continue to publish the Quarterly Remote Sensing Newsletter in January, April, July and October of 1994 and 1995. Similarly, the biannual Asia-Pacific Remote Sensing Journal will be published in January and July 1994 and 1995. Both these recurrent publications are now published under the regular-budget publication programme of ESCAP.

119. The following non-recurrent publications will also be prepared, published and disseminated as a part of the regional information service activities of ESCAP:

(a) A compendium of institutions and agencies within and outside ESCAP member countries which are using remote sensing and GIS and dealing with natural resources and environment management in order to establish an information exchange network, in December 1994;

(b) Manuals and reports on information about problems and solutions in the applications of GIS/remote sensing to integrated natural resources and environmental management, by October 1995;

(c) Reports of the pilot projects conducted under RRSP with funding support from the GIS/remote-sensing programme to participating countries by mid-1995;

(d) Proceedings of seminars, meetings and workshops organized by ESCAP during the 1994-1995 period.

120. ECA has committed itself to produce during the biennium 1994-1995 a digital atlas based on the information that was collected during the preparation of the "Cartographic Inventory Atlas" project, conducted several years ago. This atlas will spatially portray an inventory, in computer-readable form, of the existing basic information in Africa on 10 selected themes, taking into account the requirements of the planning of economic development schemes, particularly with regard to the exploitation of natural resources. This project is in line with the recent recommendations of the World Bank/EIS that an inventory of all existing cartographic information of environmental importance should be undertaken.

121. ECA will continue to publish its annual Cartographic and Remote Sensing Bulletin, of which two issues have been published. Efforts will be made to increase the quality and periodicity.

122. RECTAS disseminates information on the status of technology in the areas of photogrammetry, remote sensing, cartography and environment.

123. UNEP, as an Earthwatch activity, through its Monitoring Assessment Research Centre (MARC) will continue to publish satellite-derived data in its future publications of the Environmental Data Report (see A/AC.105/524, para. 98).

124. The work of UNEP on genetic resource databases and networks continues (see A/AC.105/491 and Corr.1, para. 97).

125. UNEP through GEMS will continue to cooperate with UNESCO and the Swiss Federal Institute of Technology, Zurich, in a World Glacier Inventory during 1994 and beyond (see A/AC.105/524, para. 100).

126. UNEP through GRID will continue to publish in 1994 and beyond the GRID News, GRID Information and GRID Case Study series, including examples of applications of GIS and remote-sensing techniques and information about application projects involving environmental problem-solving to which GRID has provided support (see A/AC.105/524, para. 101).

127. UNEP cooperation with the World Conservation Monitoring Centre (WCMC) will continue in 1994 and beyond (A/AC.105/524, para. 102).

128. UNEP's GRID programme provides ready access to nearly 1,000 environmental datasets, of which approximately 50 per cent are derived from satellite sensors. Moreover, GRID's Meta-Database Management System will assist users in identifying other sources of data, for example, through interfaces to the NASA Master Directory.

129. The series of technical publications and brochures for decision makers have always been among the main priorities of FAORSC. The 1993 issues include a new Manual for Application of SAR Data, which was prepared jointly with ESA and CCRS; Use of NOAA Remote Sensing Data for Assessment of the Forest Resource of Liberia; Use of Remote Sensing for Development Projects Assisted by the World Food Programme; Remote Sensing and its Application to Investment Project Identification and Preparation; Operational Use of Environmental Satellite Remote Sensing and Satellite Communications Technology for Global Food Security and Locust Control by FAO; Calibration and Integrated Modelling of Remote Sensing Data for Desert Locust Habitat Monitoring; and Land Cover Mapping by Satellites: Challenge and Hope for Developing Countries. The strong emphasis on publications as one of the most effective technology transfer tools, will continue in the 1994-1995 biennium and future years.

130. FAO plans to strengthen further its role as the clearing-house for information on the agricultural, forestry and fisheries applications of remote sensing. In 1994 its Remote Sensing Centre plans to publish a quarterly FAO Remote Sensing Newsletter.

131. The World Bank supports the development and implementation of national and regional EIS as components of National Environmental Action Plans.

Special projects or ad hoc activities

132. The WHO Division of Environmental Health, in collaboration with other relevant WHO programmes and United Nations agencies, will organize an expert meeting on remote-sensing applications for human health in 1993.

133. FAO, with funding support from the Government of the Netherlands, continues to provide operational remote-sensing inputs into the Global Information and Early Warning System on Food Security (GIEWS) and the Desert Locust Prevention Programme through the upgraded ARTEMIS. Research work will continue on the integration of remote-sensing-based and meteorological rainfall estimates and on improvement of data on the length of growing periods. The ARTEMIS vegetation index products will be extended to cover the whole of Asia and Latin America in addition to their current coverage of Africa and South-East Asia. FAO will develop a 10-year archive of ARTEMIS vegetation data.

134. GIEWS has the unique responsibility of providing early warning of food security emergencies for the whole world. Remote sensing and agrometeorological data and information are used as one of the inputs in the evaluation and assessment process. A GIEWS computer workstation was designed to incorporate all

necessary inputs and functions in a single package, i.e. satellite image display and analysis, agrometeorological map display and analysis, map-image overlays, spreadsheet manipulation, graphic output production, file transfer between programmes and database creation. The development of the GIEWS workstation, funded by EC, was begun in 1992 in cooperation with the University of Arizona, United States, and will take two years.

135. FAO, as a spin-off of ARTEMIS development, in cooperation with the Government of the Netherlands, prepared a project proposal which is being considered by the Government of the Netherlands for funding in 1994, for the design of RESPAS. This dedicated image processing and GIS system will be optimized for assessment and monitoring of forest cover based on high-resolution remote-sensing optical and microwave image data.

136. FAO's Forest Resources Assessment 1990 project is based upon the use of representative samples, collected on different dates, of high-resolution optical and microwave remote-sensing image data for the assessment and monitoring of tropical forest cover and land use. Change matrices will be derived which describe in more detail than heretofore possible the changes over time in the variables observed at the global, regional and subregional levels, which should lead to a better understanding of the processes of deforestation and forest degradation.

137. FAO, in cooperation with ECA, is continuing preparatory activities for a regional project entitled "Africa Land Cover Map and Digital Geographic Database". Its objective is to provide reliable and timely geographic information needed for sustainable management of land and water resources and for environmental protection. The project, to be executed by FAO in cooperation with ECA and other interested United Nations bodies, is to be implemented in African regional remote-sensing centres. FAO has approved funding of its preparatory phase, which includes organization of the ECA project preparatory meeting at Addis Ababa in April 1994.

138. RCSSMRS will continue to publish its regular editions of newsletters and information brochures.

### 4. Establishment of centres for space science and technology education

139. In response to General Assembly resolution 45/72 of 11 December 1990, in which the General Assembly endorsed the establishment of regional centres for space science and technology education in developing countries, the United Nations Programme on Space Applications has taken a number of steps to implement the United Nations initiative to establish such centres for space science and technology education in developing countries, which are expected to enhance the academic and professional capabilities and technical infrastructure in space science and technology in each region.

140. The United Nations has completed evaluation missions in Africa and Latin America and the Caribbean with the aim of establishing regional centres for space science and technology education in those regions. Similar missions are scheduled for ESCWA and ESCAP in 1994.

141. Each of the centres will be housed in a major science-and-technology-oriented university or a space research institution with an ongoing education programme to afford the centre optimal utilization of the existing professional staff and physical infrastructure at the host institution. The initial programme of the centre will focus on remote-sensing technology and related application disciplines. Each of the centres will be specifically designed so that it may:

(a) Contribute significantly to indigenous capability development in remote sensing, including satellite meteorology and environment-related disciplines in each participating country;

(b) Enhance scientific and technical education in each participating country;

(c) Enhance the quality and quantity of contributions of graduates of participating countries in the overall development of their countries and in the management of their resources and their environment;

(d) Strengthen the capabilities of institutions of higher learning and national and regional remote-sensing user assistance and training centres.

142. ESCWA is continuing its efforts to follow up establishing the ESCWA Centre for Outer Space Science and Technology Education. Invitations to host the Centre were circulated to a number of countries which showed an interest in doing so; three countries have so far offered their facilities for hosting the Centre. Contacts have also been made to organize an evaluation mission in the region to assess the adequacy of the facilities offered to host the Centre.

143. ECA, in cooperation with the United Nations Office for Outer Space Affairs, will foster the establishment of a regional centre for space science education in Africa as a contribution to strengthening human resources development in the region, complementing the training currently offered by the existing regional centres.

144. FAO supports and plans to cooperate with the proposed regional centres for space science and technology education within its mandated areas. The centres will significantly contribute to strengthening educational opportunities in the peaceful uses of outer space in developing countries. FAO will be particularly interested in the programmes of the centres related to applications of remote sensing and GIS to inventories of renewable natural resources, natural disasters control and early warning systems.

## B. Communications

### 1. Education and training programmes

#### Training courses, workshops and seminars

145. The United Nations Space Applications Programme plans to hold a United Nations Workshop on Communications Technology, in Europe, in 1995.

146. The World Health Organization (WHO) will continue its efforts towards the development and strengthening of communications systems support to primary health care in remote areas (see A/AC.105/415, para. 68, and A/AC.105/524, para. 119).

147. DHA, following its 1991 Tampere Conference on Disaster Communications, convened a conference in 1993 for the negotiation of an international convention on disaster communications, establishing mechanisms to improve international cooperation.

148. DHA plans to continue to participate in regional workshops and seminars on disaster communications for 1994 and beyond.

#### Fellowships

149. Through the United Nations Programme on Space Applications, ESA is providing long-range fellowship support for candidates from developing countries, and negotiations are under way for projects and fellowships through the Government of Austria.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects

Provision of expert services

150. ITU activities in the area of satellite communications include the following:

(a) ITU will continue to provide, at the request of member administrations, the experts participating in satellite Earth station projects and in the planning of regional or domestic satellite communication systems;

(b) ITU will organize seminars on satellite communications for developing countries from 14 to 18 November 1994 at Geneva and two regional seminars in 1995;

(c) Member administrations will continue to be informed regularly through the BR "Weekly Circular" and the special sections annexed thereto of frequency assignments and orbital positions communicated to the Bureau in space radiocommunication services. BR will respond to requests for advice from administrations on specific topics, or in providing information and documentation, mainly in relation to space radiocommunication services.

Study and pilot projects

151. The ITU/RASCOM transitional stage report was considered by the Conference of African Ministers for Telecommunications, held at Abidjan in May 1992. It was decided to establish the RASCOM organization with its headquarters based at Abidjan. It will start operations by the pooling of transponders of countries which operate or plan to operate domestic satellite networks.

152. The objective of the RASCOM project is to provide an efficient and economical means of telecommunications and information services, with a view to fostering the socio-economic and cultural development of African countries. The requirements for satellite sound and television broadcasting for all African countries are included in the project, using the appropriate technologies of a regional African satellite system which is to be properly integrated in the existing and planned national networks.

153. UNESCO activities included the following:

(a) UNESCO, as a member of the Inter-Agency Consultative Committee (IACC) on the RASCOM project, is acting in an advisory capacity and is providing assistance to this project;

(b) With respect to the decisions and recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82), UNESCO and the International Programme for the Development of Communication (IPDC) will continue to make every effort, within the scope of their mandate and subject to the availability of financial resources, to assist all member States, in particular developing countries, to promote the use of space technology for economic, social and cultural development;

(c) Either by itself or in collaboration with ILO and WIPO, UNESCO will undertake various actions to encourage further ratifications and acceptance of the Convention Relating to the Distribution of Programme-carrying Signals Transmitted by Satellite (Brussels, 1974). The search for solutions of the copyright and neighbouring-rights problems raised by the use of satellites for broadcasting purposes will remain one of the concerns of UNESCO. In particular, this relates to the copyright problems raised by the case of the direct broadcasting satellites. The legal aspects of the use of satellite remote-sensing data may also be explored.

154. UNESCO is continuing to examine different ways and means of making wider use of low and geostationary-orbit satellites systems for communication, information, informatics, education, science, culture and environmental protection in the implementation of programmes and projects, such as the following:

(a) At the twenty-sixth session of the General Conference of UNESCO (1991), Spain proposed that UNESCO should join the HISPASAT project. This satellite will cover Spain in direct broadcasting and Latin America, Central America and the Caribbean (fixed satellite service). It also foresees programmes for distant education. It is envisaged that in cooperation with the UNESCO Regional Office at Santiago, a study will be carried out on the establishment of a satellite network for education in connection with HISPASAT;

(b) Within the framework of the recovery plan of the Pan-African News Agency (PANA), a satellite communication network for exchange of information will be established by linking most of the national agencies in Africa (INTELSAT). These activities are conducted in close cooperation with United Nations specialized agencies, national/regional space institutions and non-governmental organizations, as well as interested member States.

155. FAO, in cooperation with ESA, in 1992 started testing the DIANA satellite communication system, which has been developed by European industry under ESA management. The DIANA system continues to provide a real-time link between FAO headquarters and user terminals at Nairobi, Harare and Accra. The system is at present in demonstration use. Although its cost cannot be justified by the FAO remote-sensing telecommunications requirements alone, it may develop into a multi-purpose, multi-user satellite telecommunications system in future. Such a development would significantly strengthen communication links between Africa and Europe.

156. At the seventeenth session of the UNEP Governing Council in May 1993, a resolution was passed to establish a satellite-based communications system named MERCURE for transmission of environmental data, and to provide high-speed communications links between UNEP headquarters, UNEP regional offices and GRID regional and national cooperating centres. ESA member States participating in the implementation of MERCURE have agreed to provide a generous donation of 16 satellite ground stations. MERCURE is expected to meet UNEP's immediate and near-future communication requirements during 1994-1995 and beyond. The longer-term potential for MERCURE includes: integration with the United Nations Backbone Satellite Communication Network; link to FAO-based DIANA network; and expanding the network in developing countries.

157. WHO is following the progress of the development of satellite networks to improve health conditions, particularly for enhanced communications support in rural areas (see A/AC.105/465 and Corr.1, para. 99). WHO continues to use the low-orbit satellite services of SatelLife, primarily for electronic mail (E-mail) services between six African member States, the WHO Regional Office for Africa and WHO headquarters at Geneva. Similar plans are being made for low-orbit communications uses by some of the WHO member States of the Eastern Mediterranean Region. Also, WHO is studying the feasibility of an offer by the authorities of the Russian Federation for the use of existing and to-be-launched Russian low-orbit satellites for worldwide communications, particularly covering the geographical areas not already served.

158. The WHO-executed Onchocerciasis Control Programme is currently expanding its network and the teletransmission of hydrological information through its own emitting and receiving stations in 11 West African countries.

159. DHA and the IDNDR secretariat will continue to cooperate with organizations within the United Nations system and other specialized organizations in the study and practical use of satellite terminals and low Earth orbit satellite systems for emergency communications.

### 3. Dissemination of information on the status of technology

160. The United Nations Programme on Space Applications will publish the 1994 edition of Seminars of the United Nations Programme on Space Applications: Selected Papers on Remote Sensing, Satellite Communications and Space Science, which will contain manuscripts from the activities of the Programme conducted in 1993 by the Eugenides Foundation, Greece (see para. 116 of the present report).

161. The ITU will continue to contribute in this sphere with the following activities:

(a) Studies on technology and spectrum/orbit utilization for space communications will be continued in the study period 1993-1995, in the light of technological developments by ITU Radiocommunication Study Groups 1, 4, 5, 7, 8, 10, 11 and 12;

(b) Supplement No. 1 (Effect of WARC-88 Decision) and Supplement No. 2 (Computer Programs for Satellite Communications) to the BR Handbook on Satellite Communications (Fixed-Satellite Service) have already been published. Supplement No. 3 (Very Small Aperture Systems and Earth Stations) will be published in 1994, and Supplement No. 4 (Satellite Links in the Integrated Service Digital Network) is in preparation;

(c) The BR handbook on satellite-based services of time and frequency dissemination is in preparation;

(d) The Telecommunication Standardization Bureau (TSB) is continuing its work on a study programme concerning space technology in the area of services, e.g. aeronautical mobile services, maritime mobile services, land mobile services, and in the field of integrating satellite systems into the general telecommunication network. Accordingly, it is studying the use of telecommunication satellites for the whole range of transmissions: telephony, television, teleconference, data transmission, business services, communications between computers, telecommunication services to remote regions and weather forecasting. Where necessary, it also investigates the signalling associated with these various types of information. As stated in previous ITU reports on telecommunication in outer space, numerous study groups are developing standards, drawing up specifications and contributing to this work. These studies cover also the integration of satellite systems used for aeronautical mobile services, maritime mobile services and land mobile services. TSB (ITU) is also developing recommendations in order to assure a continuing and full integration of the satellite transmission medium in public digital networks, including the Integrated Service Digital Network taking account of the emerging technologies, applications and services;

(e) BR (ITU) organizes biennial (regular) seminars and regional seminars, as required, on frequency management and the use of the geostationary orbit, with a view to providing technical assistance to the participating countries. The next regular seminar will be held from 14 to 18 November 1994;

(f) ITU publishes monthly in its Telecommunication Journal a list of satellites launched, together with associated information and orbital parameters;

(g) ITU also publishes a Report on Telecommunication and the Peaceful Uses of Outer Space;

(h) ITU is organizing world and regional Telecommunications Exhibitions and Forums (TELECOMs). Africa TELECOM 94 will be held at Cairo from 25 to 29 April 1994, and will be followed by World TELECOM 95, at Geneva, from 3 to 11 October 1995.

162. BR (ITU) publishes quarterly an updated list of the orbital positions and associated frequency bands for space stations on board geostationary satellites and non-geostationary space systems. In a more detailed

manner, BR publishes all the technical characteristics of those satellite networks which are submitted to it within the framework of the coordination or notification procedures for their recording in the Master International Frequency Register.

163. UNEP is promoting modern telecommunication methods, including satellite-based telecommunications for electronic messaging and disseminating environmental information. For example, "Environet", the electronic mail system of its International Referral System for Courses of Environmental Information (INFOTERRA) links UNEP offices and INFOTERRA national focal points, and provides a gateway to national and international environmental databases. Environet is established on Telecommunications Network (TCN)/Dialcom.

164. The UNEP International Cleaner Production Information Clearing-house (ICPIC) is an on-line computerized information exchange system, part of the UNEP Cleaner Production Programme to promote the use of clean production technologies on a global scale. The system provides three direct-access nodes through the telephone network and another eight access nodes through Telenet, a data packet switching system (PSS), or through another national PSS such as Thaipac for Thailand or the United Kingdom PSS. The system should be able to meet immediate and near-future on-line access requests during 1994 and beyond.

165. WHO will pursue its efforts to develop and strengthen communications systems in support of primary health care gained by promoting the exchange of information and experiences and by recommending effective means of communication. Increasingly, requests to WHO for support to member States in the area of computing include requests relating to computer-assisted telecommunications. Furthermore, research institutions are advised on and assisted in connecting to the international electronic mail (E-mail) services serving the academic and research community.

### 4. Regulation of the use of the geostationary satellite orbit and the radio-frequency spectrum allocated to space communication services

166. The Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space will continue in 1994, in accordance with General Assembly resolution 47/67 of 14 December 1992, to consider, through its working group, matters relating to the definition and delimination of outer space and to the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of ITU.

167. The World Administrative Radio Conference (WARC-92) for dealing with frequency allocations in certain parts of the spectrum allocated a number of the frequency bands for new space service applications, including: space operations and space research services; satellite sound broadcasting; wide RF-band, high-definition television (HDTV); the mobile-satellite service; and low-orbit satellites.

168. Following the decisions of WARC-92, the ITU Radiocommunication Study Groups will continue the studies in the field of space radiocommunications. A number of urgent ones cover:

(a) Compatibility between the fixed-satellite service (Earth-to-space) and the space research and Earth exploration satellite services in the 13.75-14 GHz band;

(b) Multi-service satellites and fixed satellite services in the frequency bands;

(c) The mobile satellite service and other services in the same frequency bands;

(d) Protection of the space services operating in the bands near 2 GHz from harmful interference from emissions by stations of the mobile service;

(e) Implementation of HDTV in the 12 GHz band in countries with climatic zones having a high rainfall rate;

(f) Introduction of satellite and terrestrial digital sound broadcasting;

(g) Establishment of standards governing the operation of low-orbit satellite systems;

(h) The spurious emissions resulting from space services transmission.

The first study should be completed prior to 31 January 1994.

169. WIPO will continue to study various aspects of the law of copyright and so-called neighbouring rights (that is, rights granted to performers, producers of phonograms and broadcasting organizations) that relate to the use of new technologies, including broadcasting by satellites. The WIPO programme for 1992-1993 contained provisions for continuing preparation of a possible protocol to the Bern Convention for Protection of Literary and Artistic Works which dealt with a number of questions, inter alia, the question of broadcasting by satellites. Those questions also dealt with the preparation of a WIPO model law on the protection of producers of sound recordings and a WIPO international symposium (held at Harvard University, Cambridge, Massachusetts, in March-April 1993) on the impact of digital technology on copyright, including digital broadcasting by satellites. The above-mentioned activities will probably be continued in the 1994-1995 biennium.

170. Following the adoption by the assembly of the International Civil Aviation Organization (ICAO) of resolution A29-11 on the "Use of space technology in the field of air navigation", ICAO activities, with respect to the communications, navigation, and surveillance and air traffic management (CNS/ATM) systems, are being progressively directed towards the implementation of these systems with an emphasis on assistance to States for harmonization of the transition to the new systems. The CNS/ATM systems adopted by ICAO are largely dependent on space technology.

171. ICAO is being assisted by the Special Committee of its Council on the Monitoring and Coordination of Development and Transition Planning for the Future Air Navigation Systems (FANS Phase II) in finalizing the work on the recommendations for the institutional arrangements, global coordination plan and monitoring of research and development programmes related to the CNS/ATM System.

## C. Meteorology and hydrology

### 1. Education and training programmes

Training courses, workshops and seminars

172. WMO plans to continue to collaborate with the United Nations, other organizations and member countries in the co-sponsorship of training events during 1994-1995. The WMO proposals for satellite-related events for the biennium 1994 and 1995 include the following:

(a) Training courses on tropical meteorology and tropical cyclone forecasting;

(b) Training on communication and data management techniques;

(c) Training seminar on new forecasting techniques in aeronautical meteorology;

(d) Training seminar on the use of environmental satellite data.

173. ITU Radiocommunication Study Group 7 will continue to study questions relating to the meteorological-satellite service and associated technologies through the next study period, 1990-1994.

174. UNEP will continue its work with the African Centre for Meteorological Applications for Development (ACMAD) (see A/AC.105/491 and Corr.1, para. 135).

Fellowships

175. WMO grants fellowships under its Voluntary Cooperation Programme and its regular budget, as well as under UNDP and trust funds for studies or training in meteorology and operational hydrology, including studies and training in satellite meteorology, interpretation of meteorological satellite photographs, satellite transmission systems and nephanalysis. In addition to fellows being trained at some of the WMO regional meteorological training centres, some countries also provide training in numerical weather prediction products and interpretation of meteorological satellite data through fellowships offered by them under the Voluntary Cooperation Programme.

## 2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects

176. As part of joint United Nations/International Space Year (ISY) and ESA activities, ESA has started distributing space-acquired data to a number of African research and applications institutions and centres in four of the countries that are within the coverage of its satellite data-receiving stations at Maspalomas and Fucino. ESA will assess the performance of these institutions in order to determine their needs, particularly in personnel development.

177. In accordance with the recommendations of the United Nations IOMAC meeting held at Karachi, Pakistan, in July 1989 (A/AC.105/439, paras. 12-35), arrangements are being made for a pilot project with the NOAA/National Environmental Satellite Data and Information Service, involving two teams of four to five remote-sensing scientists from the IOMAC member States working together for about six months (see A/AC.105/465 and Corr.1, para. 122).

178. The application of satellite technology in meteorology and operational hydrology forms an important element of the technical cooperation activities of WMO. These activities are generally undertaken with assistance from the voluntary cooperation programmes of either WMO or UNDP. The following activities are planned for 1993 and future years:

(a) Africa. A number of countries, including Germany, France, Italy, the United Kingdom and the United States, are donating data collection platforms (DCPs) for the collection of meteorological data via the geostationary meteorological satellite Meteosat to 50 countries in Africa in order to upgrade meteorological observations. During 1993, MDD will be evaluated as part of the Operational World Weather Watch Systems Evaluation for Africa in Niger, within the framework of AGRHYMET and ACMAD. Furthermore, a network of eight satellite stations of the International Maritime Satellite Organization (INMARSAT) are foreseen to be installed in the CILSS countries with funding from USAID, to enhance data and products flow between the AGRHYMET Regional Centre at Niamey and the national AGRHYMET centres. Some key stations in the Zambezi river basin will be equipped with DCPs using the Meteosat system for collecting data. A multi-donor project is now in preparation to monitor desert locusts in Africa. Under the project,

50 automatic stations will be installed. In the Niger river basin, 64 DCPs using the Argos system have been operational for a number of years, and plans are being made to install more recent equipment. In collaboration with the World Bank, WMO has drawn up plans to set up in Africa advanced hydrological and environmental monitoring systems using Meteosat. About 100 stations will be installed on major rivers, costing between $10 million and $20 million over a period of five years.

(b) Asia. UNDP provided valuable assistance to developing countries in Asia and the South Pacific region through national as well as regional projects. Satellite ground stations were installed in Bangladesh, the Democratic People's Republic of Korea, Iran (Islamic Republic of), Sri Lanka, Viet Nam and Yemen. A UNDP country programme in China has provided a modern satellite data archiving and retrieval system. Automatic weather stations have been installed on the Cook Islands, Solomon Islands and in Tokelau with UNDP support;

(c) Americas. As part of a FINNIDA project, meteorological communications via satellite are planned to be used for the seven countries of Central America. Studies are under way for a possible application of the same technology to the remaining countries in the southern part of WMO Regional Association IV. In Colombia, 25 DCPs have been installed in the Magdalena-Cauca basin for hydrological forecasting purposes using NOAA geostationary environmental satellites (GOES). A plan for the new Regional Meteorological Telecommunication Network (RMTN) based on two-way multipoint telecommunication services via satellites has been agreed upon, and is scheduled for implementation in the first half of 1994, involving more than 20 countries. The plan will be implemented as part of a project of FINNIDA for the Central American countries and through other international cooperation funding, mainly from the United States, for the remaining countries in the southern part of the North and Central American region. The implementation of this plan will dramatically improve the meteorological telecommunication system in the region.

179. FAO, within the framework of the ARTEMIS phase III project, will continue a major satellite rainfall estimation calibration programme in cooperation with the University of Reading, United Kingdom, and regional FAO projects in the IGADD and SADCC regions. Under this programme, the ground-measured rainfall data from approximately 1,000 meteorological stations in Africa are systematically correlated with cold cloud duration data derived from the ARTEMIS hourly Meteosat observations. Meteosat-based quantitative rainfall estimates are obtained by linear regression. Their accuracy is expected to increase with extended duration of the calibration programme.

### 3. Dissemination of information on the status of technology

180. The application of satellite technology is particularly important in activities carried out under the Tropical Cyclone Programme, especially in real-time monitoring and analyses of tropical cyclones for accurate forecasts and early warning services, and associated floods, landslides and storm surges.

181. Within the framework of the WMO plan of action for the International Decade for Natural Disaster Reduction, a special project on a tropical cyclone warning system for the south-west Indian Ocean region has been established with financial assistance by the European Development Fund. This project to upgrade the tropical cyclone warning system for the south-west Indian Ocean is based on the application of meteorological satellite and microcomputer technology and on the transfer of scientific knowledge.

182. Considerable efforts continue to be undertaken within WMO, in cooperation with IOC (UNESCO), to provide information on developments in INMARSAT.

183. The use of data collection capabilities on geosynchronous meteorological satellites is growing rapidly. Of particular importance for WMO is the use of the International Data Collection System, where the main emphasis is on obtaining data from above ocean areas. The use of data dissemination capabilities on

geosynchronous meteorological satellites is also progressing. WMO has adopted a new plan for the Regional Meteorological Telecommunication Network (RMTN) in North and Central America based on two-way multipoint telecommunication services via satellite. The new RMTN will link meteorological centres in Central America and the Caribbean area with the World Meteorological Center, at Washington, D.C. It will provide the telecommunication services required for the operation of the World Weather Watch system and will support the Tropical Cyclone Programme.

184. The overall long-term goals of the WMO/ICSU/World Climate Research Programme (WCRP) are to determine to what extent climate can be predicted and the extent of human influence on climate, including activities along the following lines:

(a) The scientific plan for WCRP gives high priority to understanding the effects of cloudiness on the radiation energy budget. The International Satellite Cloud Climatology Project (ISCCP), set up in July 1983, aimed at the establishment of a five-year global radiance and cloud dataset based on observations from the international array of geostationary meteorological satellites and operational polar-orbiting satellites. The project has been extended through 1995;

(b) Two major observational programmes are involved within WCRP: the study of the inter-annual variability of the Tropical Ocean and the Global Atmosphere, 1985-1995, and the World Ocean Circulation Experiment, 1990-1995. The successful launching of the joint Ocean-surface Topography Experiment/Poseidon satellite mission by France and the United States in 1992, and that of the European oceanographic satellite mission, ERS-1, in 1991, have been of particular importance for the success of WOCE;

(c) In addition to ISCCP, WCRP has initiated projects to produce monthly fields of sea-surface temperature and precipitation; these projects require substantial amounts of satellite observations;

(d) WCRP is preparing a Global Energy and Water Cycle Experiment (GEWEX), planned for 1995-2000, based on the multinational Earth Observing System. A major international component of the experiment will be the GEWEX Continental-scale International Project (GRIP).

185. Within its training publications programme, WMO updated publication No. 240, Compendium of Training Facilities for Meteorological and Operational Hydrology.

186. WMO has become a full co-sponsor of GOOS (IOC), including in particular the scientific and technical planning and intergovernmental aspects. WMO provides staff and other support to the GOOS secretariat, and will actively participate in all aspects of GOOS development and implementation.

187. UNEP will continue to participate in developing and supporting the programmes of the GCOS secretariat and GTOS, which is currently under discussion, in 1994-1995 and beyond (see A/AC.105/524, para. 155).

188. UNEP is continuing its ongoing close cooperation within the Global Ozone Observing System ($GO_3OS$) (see A/AC.105/491 and Corr.1, para. 148).

189. UNEP is also continuing its support for Global Atmosphere Watch (GAW) as an early warning system (see A/AC.105/491 and Corr.1, para. 150).

190. UNEP, through GEMS, will continue to support the International Satellite Land-Surface Climatology Project (ISLSCP) (see A/AC.105/491 and Corr.1, para. 160).

191. Climate monitoring activities within the World Climate Data and Monitoring Programme involve satellite data including sea-ice, snow cover, solar radiation, aerosol optical depth, albedo and clouds. WMO's climate data information referral system (INFOCLIMA) includes information on some available satellite datasets needed for climate monitoring and research. The World Climate Applications and Services Programme (WCASP) continues to investigate and promote development of potential uses of satellite data in climate applications. WMO recently established the major Climate Change Detection Projects (CCDP) that widely uses satellite data.

192. In 1989, the GAW system was established as an early warning system to detect changes in the greenhouse gases, including ozone, and other trace substances in the atmosphere that may lead to global climate change. GAW consists of the ground observations made by the Background Air Pollution Monitoring Network (BAPMoN) to provide information required to verify future satellite-based observations of some atmosphere constituents. The second part of GAW is $GO_3OS$, which measures atmospheric ozone with more than 150 ground-based stations, supplemented by a few satellite observing systems. Such activities contribute to Earthwatch by providing data to GEMS.

193. The WMO Commission for Atmospheric Sciences (CAS) continues to rely on the use of satellite data for research, for both climate studies and weather analysis and prediction of all time scales. The WMO Programme on Short- and Medium-range Weather Prediction Research (PSMP) and Tropical Meteorological Research (TMRP), will study the application of high-resolution quantitative satellite data.

194. Based on the structure of the WMO hydrology and water resources programme, a number of projects relating to hydrological networks and instrumentation, hydrological forecasting methods and systems, and the application of remote-sensing techniques to operational hydrology are undertaken on a continuing basis. The programme is revised by the WMO Commission for Hydrology every four years. The results of the projects formulated by the Commission at its tenth session in 1993 will be available in 1996. Based on the Third Long-term Plan of WMO approved by the XIth Congress, this will include satellite activities relying on data for hydrological purposes collected or transmitted by satellites.

195. The WMO Commission for Marine Meteorology (CMM), the joint IOC/WMO Committee for IGOSS and the IOC Committee for the International Oceanographic Data and Information Exchange maintain a close interest in the use of satellites for both ocean observation and marine communications. A CMM/IGOSS/International Oceanographic Data Exchange (IODE) group of experts has prepared a consolidated report on polar-orbiting oceanographic satellites, and will extend this report in future to cover also geostationary satellites, other ocean remote-sensing and the management of ocean satellite data.

196. The report of the Rapporteurs of the Commission for Agricultural Meteorology on Developments in Operational Remote Sensing was published in the Commission for Agricultural Meteorology CAgM Report series and circulated to members of WMO. The tenth session of the Commission appointed a Rapporteur to study operational methods and techniques, the use of real-time data and to prepare a "Climate Application Referral System (CARS)-Remote Sensing" publication containing tested programmes and algorithms to serve as a guide to members on the use of remotely-sensed information in agrometeorology.

197. The Memorandum of Understanding signed by WMO, IOC (UNESCO), UNEP and ICSU in 1992 established GCOS, a Joint Scientific and Technical Committee, and a Joint Planning Office for GCOS.

198. At its inaugural meeting in April 1992, the Committee recommended the development of an implementation plan. The Committee supported the use of specific task groups which provided scientific and technical justification for observational systems in critical areas (e.g. atmospheric processes, atmospheric chemistry, and oceanic and land-surface processes).

199. At its second meeting, in January 1993, the Committee focused on the overall strategy issues for GCOS.

200. It was agreed that:

(a) GCOS will take an integrated view of the requirements for the total climate system including the global atmosphere, the world oceans, the land surface, the cryosphere, the biosphere and the linkages among them. GCOS will develop a comprehensive approach in specifying the required observations, recommending appropriate techniques and methodologies (both space-based and land-based), and establishing mechanisms for quality control, distribution, and archiving of data;

(b) GCOS will be an evolutionary programme built methodically upon ongoing national and international programmes. Several such programmes are currently observing critical parameters in the atmosphere, ocean and terrestrial regimes. To complement the efforts of these programmes, GCOS will propose enhancements as appropriate. It will also foster the planning, development, and implementation of new observational programmes to meet the key requirements which cannot be met by the present systems;

(c) With regard to the ocean, GCOS will develop the climate components in partnership with GOOS, which is being developed under the aegis of IOC. With regard to the land surface, GCOS will cooperate in the development of the climate component of GTOS now being established by FAO, UNESCO, UNEP and International Geosphere Biosphere Programme (IGBP) core programmes.

201. The Committee further developed an action plan for GCOS based on a strategy with the following three components:

(a) To evaluate the current observational systems and define the initial operational system to be realized early in the next century. This initial operational system will consist of currently operational components which meet climate requirements, enhancements for which there is a need and a proven technology, and an effective data management system;

(b) To identify and specify the key observations that are urgently required, but which cannot be provided using current techniques;

(c) To identify future research and development likely to lead to further requirements and additions to the operational programme.

202. Regarding the space-based observations, the Committee discussed the relationship between the GCOS planning activities and the space agencies. The Committee recommended that the GCOS programme include working groups that should address the climate observation needs, but due consideration should be given to existing working groups to avoid duplication. It was also recommended that an ad hoc working group be established to help define the overall space-based observational requirement for GCOS, and to identify gaps in current and planned programmes. Such a group could also assist with the representation of the GCOS programme within the space community.

203. As a result of recommendations of the first session of the Committee, the GCOS programme applied for and was given associate member status in CEOS.

204. IOC (UNESCO), in cooperation with ICSU and WMO, is in the process of drafting a Memorandum of Understanding concerning the creation of a GOOS.

205. UNESCO is cooperating with FAO, IGBP, UNEP and WMO in the creation of a GTOS, a potential scientific network for detecting and monitoring change in terrestrial ecosystems. A joint GTOS task force

is being organized, with support from the Swiss Federal Institute for Forest, Snow and Landscape Research for the secretariat to be located in Switzerland. A report on GTOS will be included in the UNESCO 1994 Man and the Biosphere (MAB) Digest Series.

206. UNESCO, within the framework of IHP, will support the organization of a workshop on GIS in hydrology and water resources management at Cagliari, Italy, in 1994.

207. UNESCO will publish guidelines for GIS and its application to water resources management and guidance material for information system requirements. A GIS training and demonstration material for biosphere reserve managers will also be developed.

208. UNESCO, within the framework of IHP and in cooperation with ESA and the Ministry of Environment of Venezuela, is implementing a pilot project using ERS-1 to delineate the hydrographic network in tropical forest areas.

209. UNESCO, in cooperation with WMO and within the framework of the International Geosphere-Biosphere Programme, is planning to carry out a study on an environmental model for a climatic water resources and information system. The aim of the study is to provide facilities to South American countries for water resources and environmental impact assessment studies.

210. ITU Radiocommunication Study Group 7 will continue to study questions relating to the meteorological-satellite service and associated technologies through the next study period, 1993-1995.

### D. Basic space science

211. The United Nations Programme on Space Applications will publish the 1994 edition of Seminars of the United Nations Programme on Space Applications: Selected Papers on Remote Sensing, Satellite Communications and Space Science, which will contain manuscripts from the activities of the Programme conducted in 1993 at Lagos (see para. 116 of the present report).

212. A United Nations/ESA/Planetary Society regional workshop on basic space science will be held in Egypt in 1994. Also, a series of fellowships in space research, of a duration of one year, will be offered. The United Nations, through its Programme on Space Applications, will continue to collaborate with COSPAR to support the space research activities of scientists from developing countries.

### E. Land, maritime and aeronautical mobile satellite services

213. The 1988 IMO Maritime Safety Conference adopted the amendments to the International Convention for the safety of life at sea (SOLAS) of 1974. The amendments entered into force on 1 February 1992. GMDSS is being introduced in stages and will be fully implemented on 1 February 1999. Satellite communications form a major part of GMDSS, and ships are being encouraged to install satellite equipment. The International Maritime Organization (IMO) is also continuing the preparation of a master plan of shore-based facilities for GMDSS.

214. The further development of GMDSS to provide for its orderly introduction will be continued by IMO in close cooperation with BR (ITU), WMO, the International Hydrographic Organization (IHO), INMARSAT and the System for Search-and-Rescue Operations (COSPAS-SARSAT).

215. The WHO Regional Office for Europe will continue to test a disaster management work programme in its public health aspects. For disaster management, the programme will undertake research-and-development activities in a few countries to assess the feasibility and efficiency of using the

INMARSAT services TT-3020-A Standard-C Satellite Transceiver for receiving and communicating information on disasters for prompt and appropriate response. During the earthquake disaster in Turkey in March 1992, satellite communication was used with excellent results. The Regional WHO Office for Europe is therefore in the process of acquiring an additional INMARSAT TT-3020-A Standard-C Satellite Transceiver to be placed permanently at Ankara.

216. IMO has undertaken studies on a worldwide radio-navigation system, and adopted a policy for recognition and acceptance of such systems (IMO resolution A.666 (16)). On the basis of that policy, amendments to the 1974 SOLAS Convention will be considered when IMO is satisfied that a suitable radio-navigation system meeting its requirements is operational; GPS and the Global Navigation Satellite System (GLONASS), which is a candidate system, is expected to be available for consideration and acceptance in 1993 and 1995.

217. IMO, in close cooperation with BR (ITU) and the International Hydrographic Bureau, is also undertaking a study for a worldwide system of transmission and electronic display of nautical information on board ships, including means of updating the electronic navigation chart, which will be broadcast through the INMARSAT enhanced group call and Safety Net systems. Tests of equipment based on a provisional performance standard are expected to be completed in 1993, and an operational performance standard is expected to be approved in 1994.

218. The Telecommunications Development Bureau (BDT) ITU will organize a project to elaborate master plans for the implementation of GMDSS and the development of maritime radiocommunication services.

219. ITU Radiocommunication Study Group 8 (mobile services), and particularly its Working Party 8 D, continues to deal with technical and operating characteristics necessary for compatibility, interoperability and the required performance levels for systems in the mobile satellite services. Task Group 8/1 of the Study Group deals with the satellite components of the Future Public Land Mobile Telecommunication Systems.

### F. Other activities in the field of space science and technology and its applications

220. The following international workshops are being planned by the United Nations Programme on Space Applications in 1994 and 1995:

(a) United Nations International Workshop on Spin-off Benefits of Space Technology, United States, 1994;

(b) United Nations International Workshop on the Development and Design of Small Experimental Payloads, to be hosted and co-sponsored by the Government of Spain, October 1994;

(c) United Nations International Workshop on Spin-off Benefits of Space Technology, 1995;

(d) United Nations International Workshop on the Development and Design of Small Experimental Payloads, 1995.

221. The United Nations Programme on Space Applications is planning a Second United Nations Regional Conference on Space Technology for Sustainable Development in Africa in 1995.

222. UNIDO has developed an "Outline of a UNIDO Programme for Realizing the Benefits of New Technology Spin-offs in Developing Countries (with particular reference to space technologies)", intended to promote cooperation between developed and developing countries for realizing the benefits of space technology spin-offs in developing countries.

223. In 1994, the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space will continue to consider, through its working group, the question of early review and possible revision of the principles relevant to the use of nuclear power sources in outer space, adopted by the General Assembly in 1992. It will furthermore consider, through its working group, the legal aspects related to the application of the principle that the exploration and utilization of outer space should be carried out for the benefit and in the interest of all States, taking into particular account the needs of developing countries.

## G. International space year activities

224. The United Nations and its specialized agencies carried out a series of activities in celebration of International Space Year (ISY) in conformity with General Assembly resolution 44/46 of 8 December 1989, by which the Assembly had endorsed the initiative of international scientific organizations and bodies to designate 1992 as International Space Year, as well as subsequent recommendations of the Committee on the Peaceful Uses of Outer Space. The scope of United Nations ISY activities focused on three major areas: management of the resources of the Earth and its environment; long-term education programmes; and public education. Specific activities included, but were not limited to, the organization of a number of workshops, conferences, training courses and special projects. Several projects, such as the establishment of centres for space science and technology education (see paras. 139-144 above) are continuing in 1994, and have benefited from ISY exposure.

225. WHO will continue its efforts, guided as appropriate by the deliberations of the Space Agency Forum, to develop and strengthen communications systems in support of primary health care by promoting the exchange of information and experiences and recommending effective communication policies.

226. FAO, as an affiliated member of the Space Agency Forum for International Space Year (SAFISY), actively participated in most ISY activities. This has resulted in strengthening cooperation with other SAFISY members, which will have a positive impact on several of the planned joint activities mentioned in the present report. The exhibition prepared by FAO for the ISY European Conference and for the ISY World Space Congress will become a permanent exhibition at FAO headquarters.

227. WMO will continue its participation in the Space Agency Forum. A number of DCPs and DCP receiving stations (DRSs) have been installed in Africa. The DCPs and DRSs respectively transmit and receive meteorological data through Meteosat, thereby facilitating the timely and reliable flow of essential meteorological data from and between developing countries in Africa.